OXYPLETH®

Service Manual

Pulse Oximeter

Model 520A

June 5, 2001

Catalog Number 5693-90-01

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Revision History

August 31, 1992	Release 00. This manual replaces all preliminary versions. Based on Revision 2.0 CPU software.
June 5, 2001	Revision 01. R-N905

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1 Introduction

Purpose 1.1

This manual has been prepared for technicians servicing the Novametrix Model 520A Pulse Oximeter monitor. It presents technical information relating to the monitor's theory of operation, maintenance, calibration and repair. Refer to the Pulse Oximeter Model 520A User's Manual (Catalog Number 5693-23) for additional information.

Technology Description 1.2

Pulse oximetry is a non-invasive method of monitoring the oxygen saturation of arterial blood. Oxygen saturation monitoring is intended to be used in a variety of clinical situations including, respiratory therapy, anesthesia, the intensive care unit (ICU) and neonatal (NICU) and pediatric (PICU) intensive care units.

The Model 520A Pulse Oximeter provides reliable continuous measurement, display, and alerts for oxygen saturation (SpO_2) and pulse rate. The monitor can be powered from its rechargeable internal battery or from the AC Mains.

The Model 520A utilizes sensors containing two light emitting diodes (LEDs) and a photodiode. Each LED emits a specific wavelength of light (660 and 940 nanometers) through a pulsating vascular bed to the photodiode. Oxygen saturated blood absorbs different amounts of light at each wavelength as compared to unsaturated blood. Therefore, the amount of light absorbed by the blood in each pulse can be used to calculate saturation.

The Model 520A is calibrated to display "functional" saturation. This differs from the "fractional" saturation value displayed by most co-oximeters. Functional saturation is defined as:

$$\text{Functional Saturation} = \frac{HbO_2}{100 - (COHb + METHb)}$$

HbO_2 = Fractional Hemoglobin
COHb = Carboxyhemoglobin
METHb = Methemoglobin

This can be considered to represent the amount of oxyhemoglobin as a percentage of the hemoglobin that can be oxygenated. Dysfunctional hemoglobins (COHb and METHb) are not included.

Pulse Rate is calculated by measuring the time interval between detected peaks of the infrared light waveform. The inverse of this measurement is displayed as pulse rate.

The oxygen saturation and pulse rate values are displayed on monitor's displays. The displayed values are updated once each second. Presence of a pulse is shown as a waveform on the display and indicated audibly by a user selectable "beep".

The Model 520A must be used in conjunction with SuperBright™ Sensors. These sensors have an 8700 series part number (e.g., 8776 or 8791). An INCOMPATIBLE PROBE display message will indicate a non-SuperBright™ Sensor (e.g., 86xx series) is in use.

Conventions Used In This Manual 1.3

The following conventions will be used throughout this manual:

- Normal text will be shown in this type.
- Message Center alerts and displays will be shown in this type.
- The names of the front panel pushbuttons (keys) will be shown **in this type.**

Acknowledgments 1.4

SuperBright, Y-STRIP and Y-SENSOR are trademarks of Novametrix Medical Systems Inc. SARAcap is a registered trademark of Allegheny International Medical Technology, Inc. (PPG Biomedical Systems).

2 Patient Safety

The *OXYPLETH* Pulse Oximeter Monitor, Model 520A, SpO_2 Input is electrically isolated. Patient leakage current flowing from the instrument to ground is limited to less than 10 µA at 120 VAC, 60 Hz. Patient isolation is greater than 10 MΩ, 2500 VAC rms at 60 Hz.

For maximum patient and operator safety, the following are recommended:

- **Failure of Operation:** If the monitor fails to respond as described, do not use it until the situation has been corrected by qualified personnel.
- Keep *OXYPLETH* and its accessories clean.
- Do not operate *OXYPLETH* when it is wet due to spills or condensation.
- Do not operate *OXYPLETH* if it appears to have been dropped or damaged.
- Connect the line cord only to a grounded hospital-grade outlet. *OXYPLETH* should be connected to the same electrical circuit as other equipment in use on the patient. Outlets on the same circuit can be identified by the hospital's engineering department.
- Care should be exercised to assure continued peripheral perfusion distal to the SpO_2 sensor site after application.
- Components of this product and its associated accessories which may have patient contact are free of latex.

3 Warnings

WARNING

Indicates a potentially harmful condition that can lead to personal injury

- **Explosion Hazard:** Do NOT use *OXYPLETH* in the presence of flammable anesthetics. Use of this instrument in such an environment may present an explosion hazard.
- **Electrical Shock Hazard:** Always turn *OXYPLETH* off and remove line cord before cleaning it. Do NOT use a damaged sensor or one with exposed electrical contacts. Refer servicing to qualified service personnel.
- Do not operate *OXYPLETH* when it is wet due to spills or condensation.
- Do not operate *OXYPLETH* if it appears to have been dropped or damaged.
- **Patient Safety:** Extreme care should be exercised with neonates to assure continued circulation distal to the sensor site after application.
- **Failure of Operation:** If the monitor fails to respond as described, do not use it until the situation has been corrected by qualified personnel.
- **Patient Safety:** Care should be exercised to assure continued peripheral perfusion distal to the SpO_2 sensor site after application.
- **Data Validity:** Inaccurate SpO_2 and/or Pulse Rate measurements can be caused by any of the following:
- Incorrect application or use of a sensor
- Significant levels of dysfunctional hemoglobin such as carboxyhemoglobin or methemoglobin
- Significant levels of indocyanine green, methylene blue, or other intravascular dyes
- Exposure to excessive illumination such as surgical lamps—especially ones with a xenon light source, or direct sunlight
- Excessive patient movement, venous pulsations, electrosurgical interference
- **Data Validity:** The Pulse Oximeter should not be used as a substitute for an ECG monitor. The oximeter's Pulse Rate display reflects the pulsatile flow found at the patient extremity connected to the sensor. This rate can be affected by many factors and may occasionally be "frozen."
- **Do *NOT*** attach an SpO_2 sensor distal to a blood pressure cuff. Valid data *CANNOT* be processed when the cuff is inflated. Attach the sensor to the limb opposite to the site used for the blood pressure cuff.
- **Do *NOT*** apply Y-Sensor tapes or wraps so tightly that the circulation is restricted. Inspect site often for adequate circulation - at least once every four hours. When applying sensors take note of the patient's physiological condition. For example, burn patients may exhibit more sensitivity to heat and pressure and therefore additional consideration such as more frequent site checks may be appropriate.

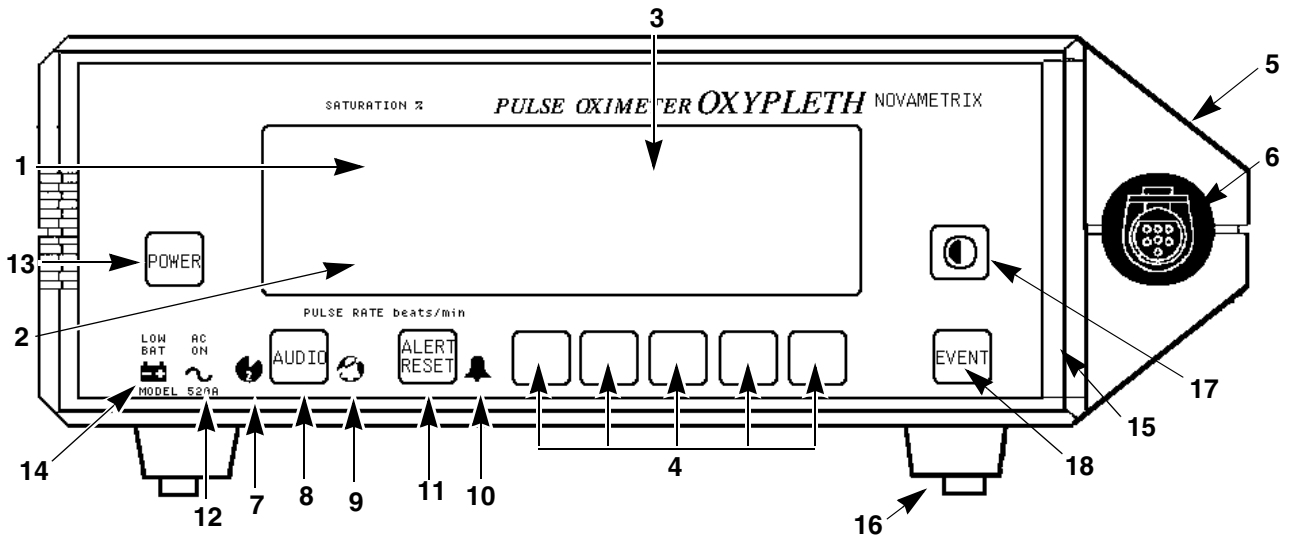
4 Cautions

CAUTION

Indicates a condition that may lead to equipment damage or malfunction.

- Do not operate *OXYPLETH* when it is wet due to spills or condensation.
- Do not operate *OXYPLETH* if it appears to have been dropped or damaged.
- Never sterilize or immerse the monitor in liquids.
- Do not sterilize or immerse sensors except as directed in this manual.
- Tension should not be applied to the sensor cable.
- Overstretching the pulse oximeter finger sensor can damage the sensor and potentially affect pulse oximeter readings. Do not stretch the finger sensor open beyond the limit for which it was designed. Overstretching can be prevented: avoid opening the sensor by any means other than squeezing the grips; Do *NOT* force the sensor onto large objects such as the bed rail.
- Do not store the monitor or sensors at temperatures less than 14° F (-10° C) or greater than 131° F (55° C).
- Do not operate the monitor or sensors at temperatures less than 50° F (10° C) or greater than 104° F (40° C).
- Federal (U.S.A.) law restricts this device to sale, distribution, or use by or on the order of a licensed medical practitioner.

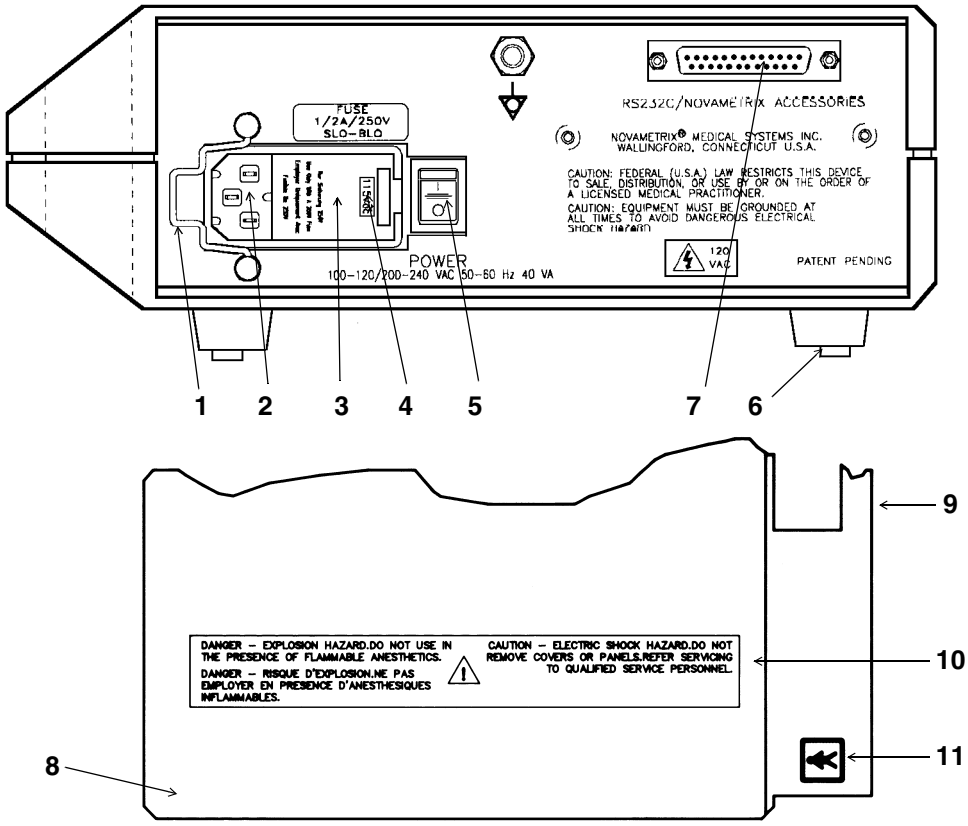
5 Front Panel



1. Saturation% Display Area; SpO_2 and alert limit settings are displayed here.
2. Pulse Rate Display Area; Pulse Rate and alert limit settings are displayed here.
3. Message Center; area where system messages are displayed. The functions of the softkeys (#4) are annotated here.
4. Softkeys # 1-5; Softkeys 1-5 (left to right) cause the action annotated in the lower half of the Message Center to occur.
5. Carrying Handle; monitor carrying handle molded into case
6. Sensor Input Connector; Connect SuperBright™ Sensors here. **Press tab on sensor connector to remove sensor. Do not twist connector.**
7. Two Minute Silence Indicator; Illuminates (yellow) when the **AUDIO** key is pressed. SpO_2 and Pulse Rate alarms are silenced for two minutes.
8. Audio key; Press and release **AUDIO** to turn on/off the two minute silence function. Press and hold (approx. 3 seconds) **AUDIO** to enable the Audio Off feature (unless disabled via Options Menu). Press and release to disable Audio Off.
9. Audio Off Indicator; Flashes (yellow) as a warning that the audible alarms have been disabled.
10. Alert Indicator; Flashes (red) when an alert/alarm occurs. Continues to flash until condition corrected and **ALERT RESET** is pressed.
11. Alert Reset key; Press **ALERT RESET** to disable any active alert indicators. Alerts will reactivate if alert condition still exists.
12. AC Power Indicator; Illuminates (green) when the monitor is connected to an AC (Mains) power source and the rear panel power switch is set to "|".
13. Power key; Press **POWER** to turn the monitor off and on.
14. Low Battery Indicator; Illuminates (red) when the monitor is powered from its internal battery and less than 30 minutes of battery power remain.
15. Red Alert Bar; Flashes (red) when an alert/alarm occurs (unless disabled via Options Menu). Continues to flash until condition corrected and **ALERT RESET** is pressed (unless "unlatched" by the user via the Options Menu).
16. Front Feet; Rubber tipped front feet (2). Kickstand; Two position kickstand (not shown) lifts front of monitor for viewing from above.
17. Contrast; Press and hold for display contrast adjustment, release when desired contrast is obtained.
18. Event; Press to mark an event in trend memory.

Figure 1. Front Panel Description

6 Rear & Top Panels


FUSE
1/2A/250V
SLO-BLO
RS232C/NOVAMETRIX ACCESSORIES
NOVAMETRIX® MEDICAL SYSTEMS INC.
WALLINGFORD, CONNECTICUT U.S.A.
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK (leakage)
120 VAC
PATENT PENDING
POWER
100-120/200-240 VAC 50-60 Hz 40 VA
1
2
3
4
5
7
6
9
DANGER – EXPLOSION HAZARD.DO NOT USE IN THE PRESENCE OF FLAMMABLE ANESTHETICS.
DANGER – RISQUE D'EXPLOSION.NE PAS EMPLOYER EN PRESENCE D'ANESTHESIQUES INFLAMMABLES.
CAUTION – ELECTRIC SHOCK HAZARD.DO NOT REMOVE COVERS OR PANELS.REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.
10
11
8

1. Line Cord Clip; This clip can be set around the line cord strain relief so that the cord cannot be pulled out of the connector.
2. Line Cord Connector; The AC (Mains) line cord attaches to the monitor here.
3. Fuse Compartment; The AC (Mains) line fuse(s) are inside this compartment. Pry open with small screwdriver.
4. AC Mains Voltage; The currently selected AC Mains input voltage is identified here.
5. AC Mains Power Switch; With switch in "O" position, AC Mains voltage does not enter monitor. With switch in "|" position, AC Mains voltage allowed into monitor to power unit and/or charge internal battery.
6. Rear Feet; Rubber tipped rear feet (2).
7. Serial Output Connector; Serial (RS232) data output here for use with Tele-Sat™ telemetry system, optional analog output module, and other RS232 interfaces. A female 25-pin "D" connector serves as the interface connector.
8. Top Cover
9. Carrying Handle; Monitor carrying handle molded into case.
10. Warning Label; Explosion and electrical shock warnings.
11. Patient Isolation Label; The Model 520A is Type BF equipment.

Figure 2. Rear and Top Panel Descriptions

7 Summary of Operation

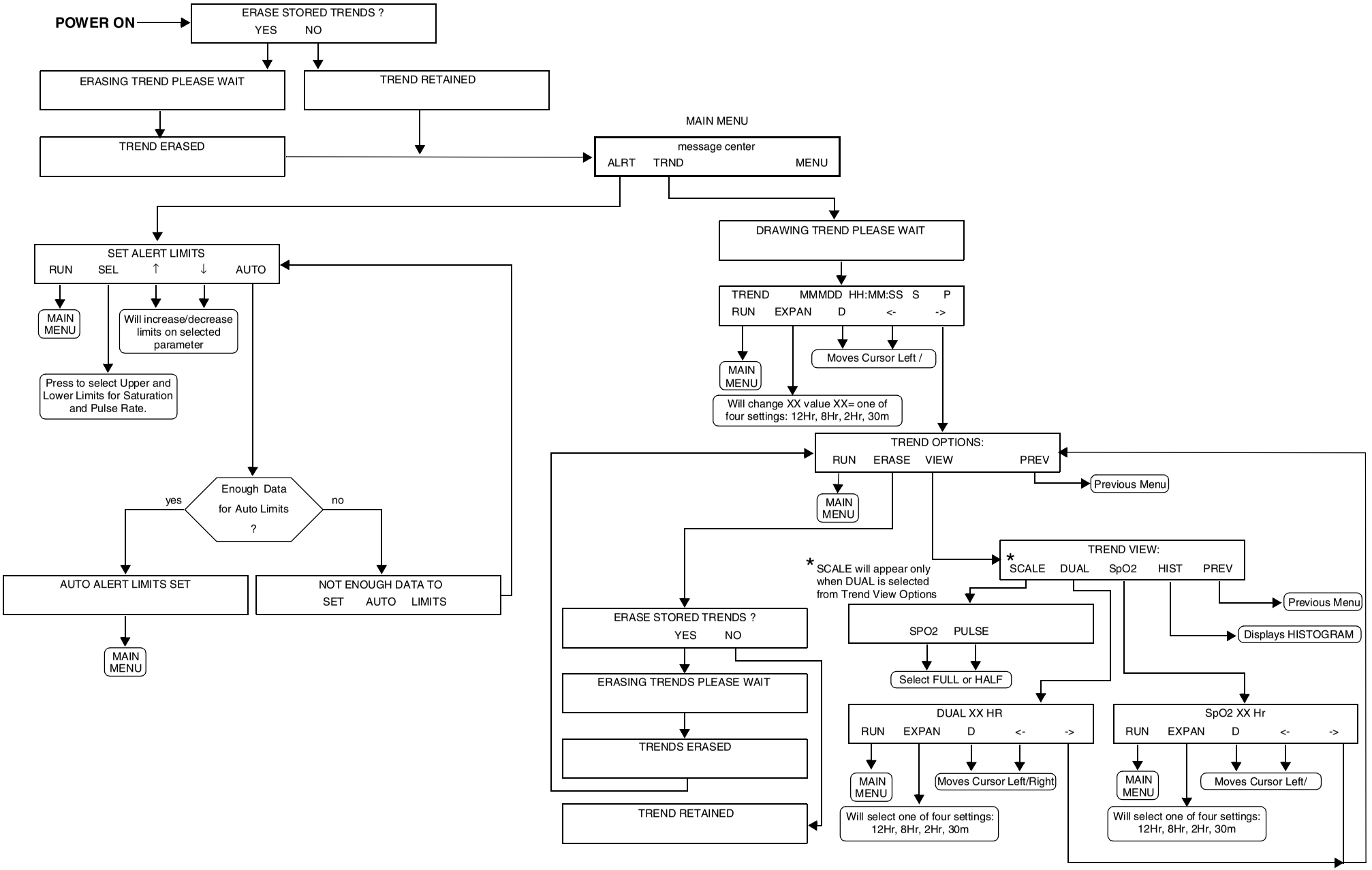
This section summarizes the operation of the Model 520A Pulse Oximeter. It is intended as a quick reference and refresher for persons who have thoroughly reviewed the Model 520A User's Manual (PN: 5693-23). Persons unfamiliar with the Model 520A should thoroughly examine the User's Manual before referencing the steps listed here.

1. If powering the monitor from the AC line voltage; Connect the line cord to the monitor and plug into a properly grounded 3-wire outlet. Set the rear panel power (Mains) switch to the | (on) position.
2. Press the front panel **POWER** key to turn the monitor on. Verify the Message Center displays `Connect SPO2 Probe` after the self-tests are complete.
3. Use the Menu System to modify the operation of the monitor to best suit your application. The Menu System menus include:
   - **ALRT** softkey - Use **SEL** to select SpO2 or Pulse limits, then use the ↑ or ↓ to set the limit to the desired value. Note that the monitor will maintain a spread of at least 5 digits between the upper and lower limit values.
   - **TRND** softkey - enters Trend mode and draws trend memory on display.
   - **MENU** then **AUDIO** softkeys - Select **Pulse** to turn on/off and control the volume of the audible beep with each detected pulse. Select **ALERT** to control alert volume.
   - **MENU** then **AVG** - Select either 2 second or 8 second SpO2 averaging time.
   - **MENU** then **LITE** softkeys - toggles backlight between bright and dim.
4. Verify that the SpO_2 and Pulse Rate alert limit settings are consistent with your monitoring application.
5. Connect a SuperBright™ (87xx series) sensor to the front panel input. Apply the sensor to the patient.
6. Check that within several seconds the patient's SpO_2 and Pulse Rate are displayed on the monitor.
7. As necessary, refer to the appropriate sections within the User's Manual for detailed operating instructions and explanations.

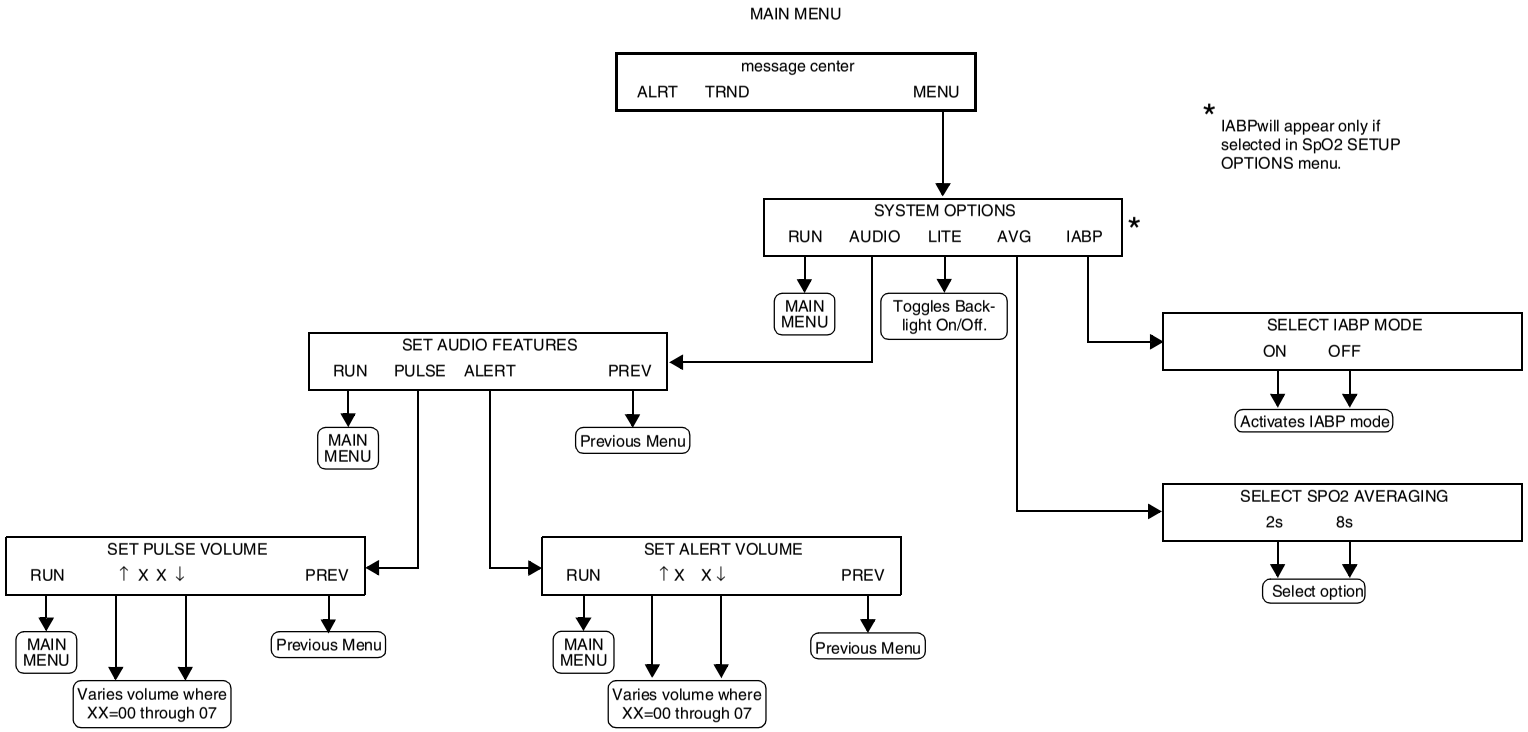
8 Menu Trees

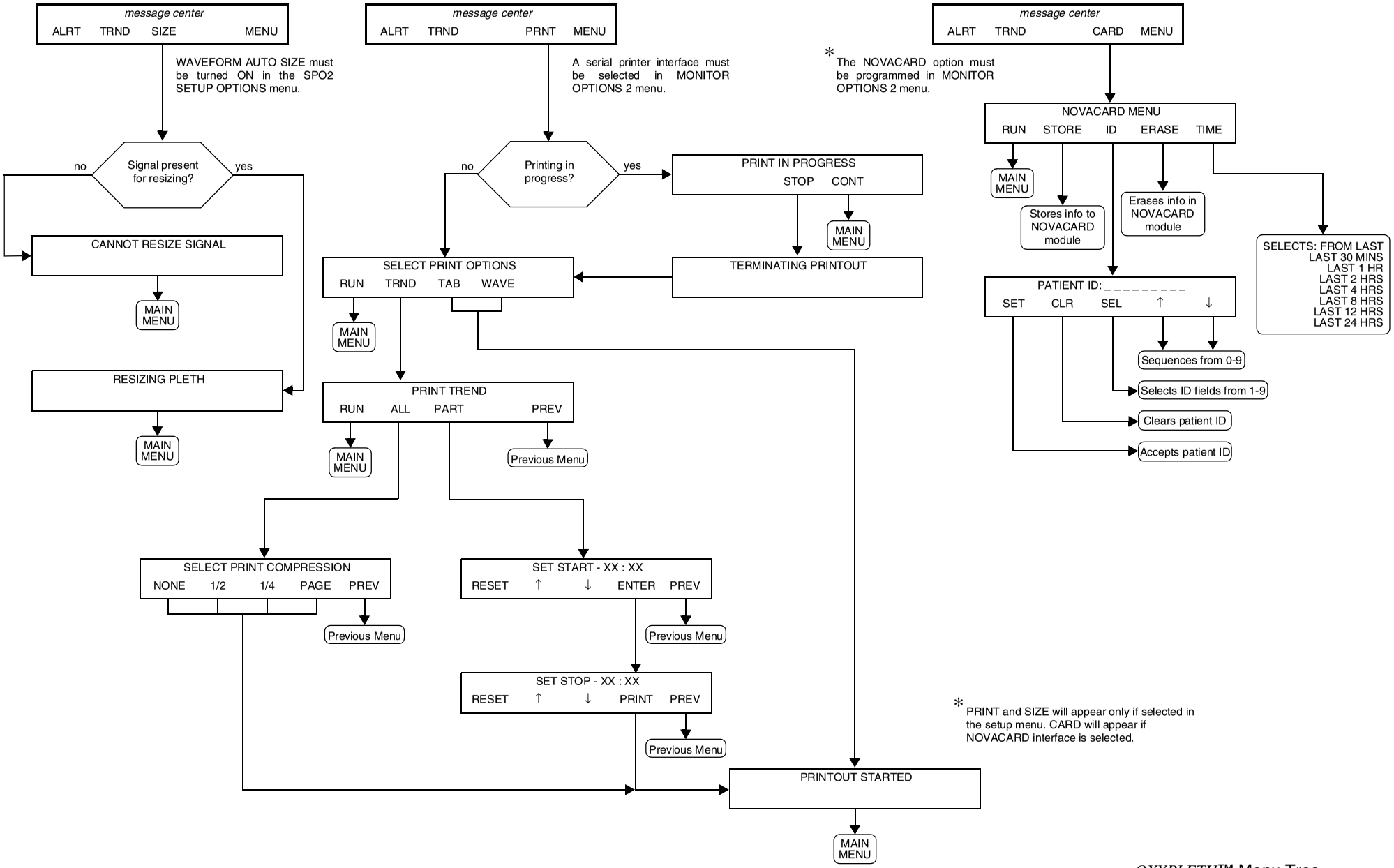
The *OXYPLETH* menus are described on the following pages.

OXYPLETH™ Menu Tree
Revision 2.7 Software
7-Feb-97



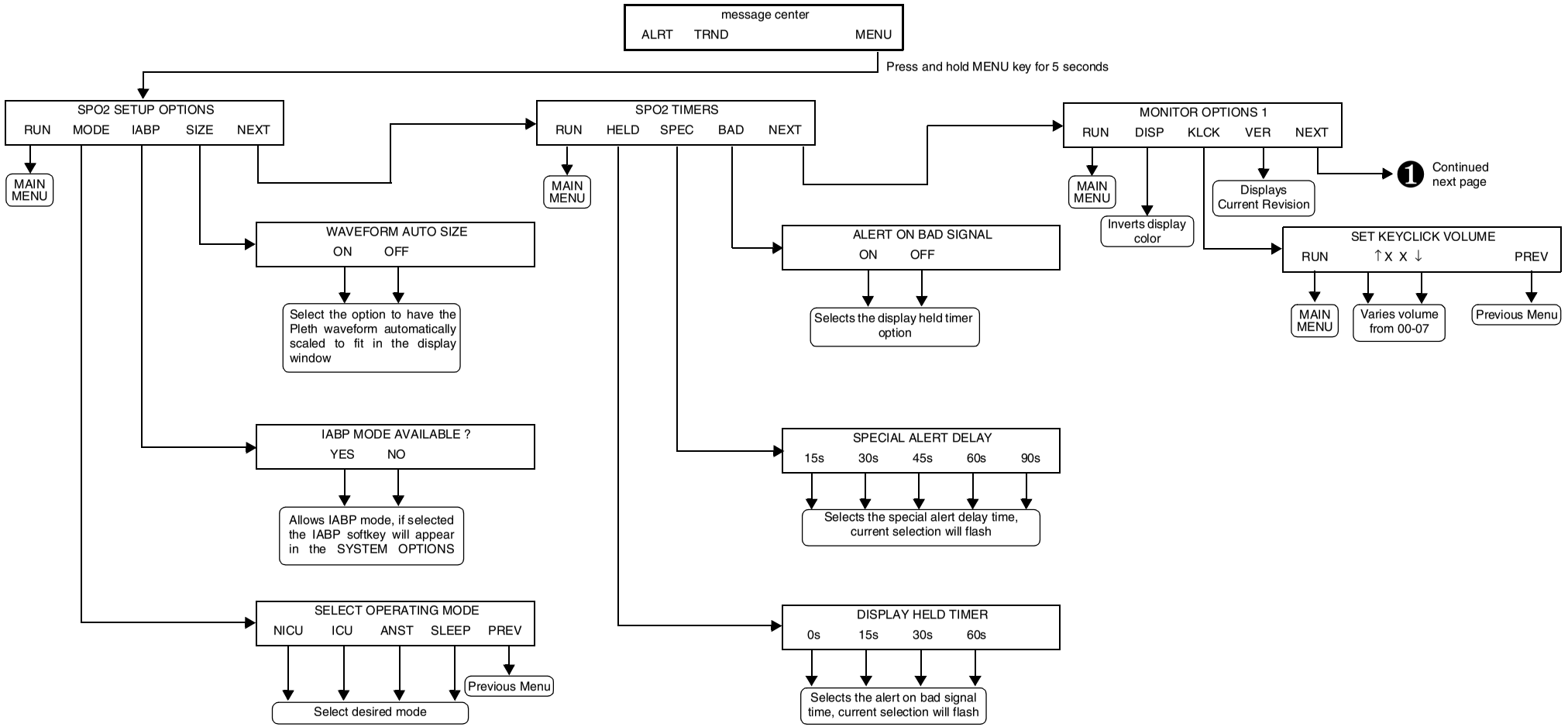
OXYPLETH™ Menu Tree
Revision 2.7 Software
7-Feb-97

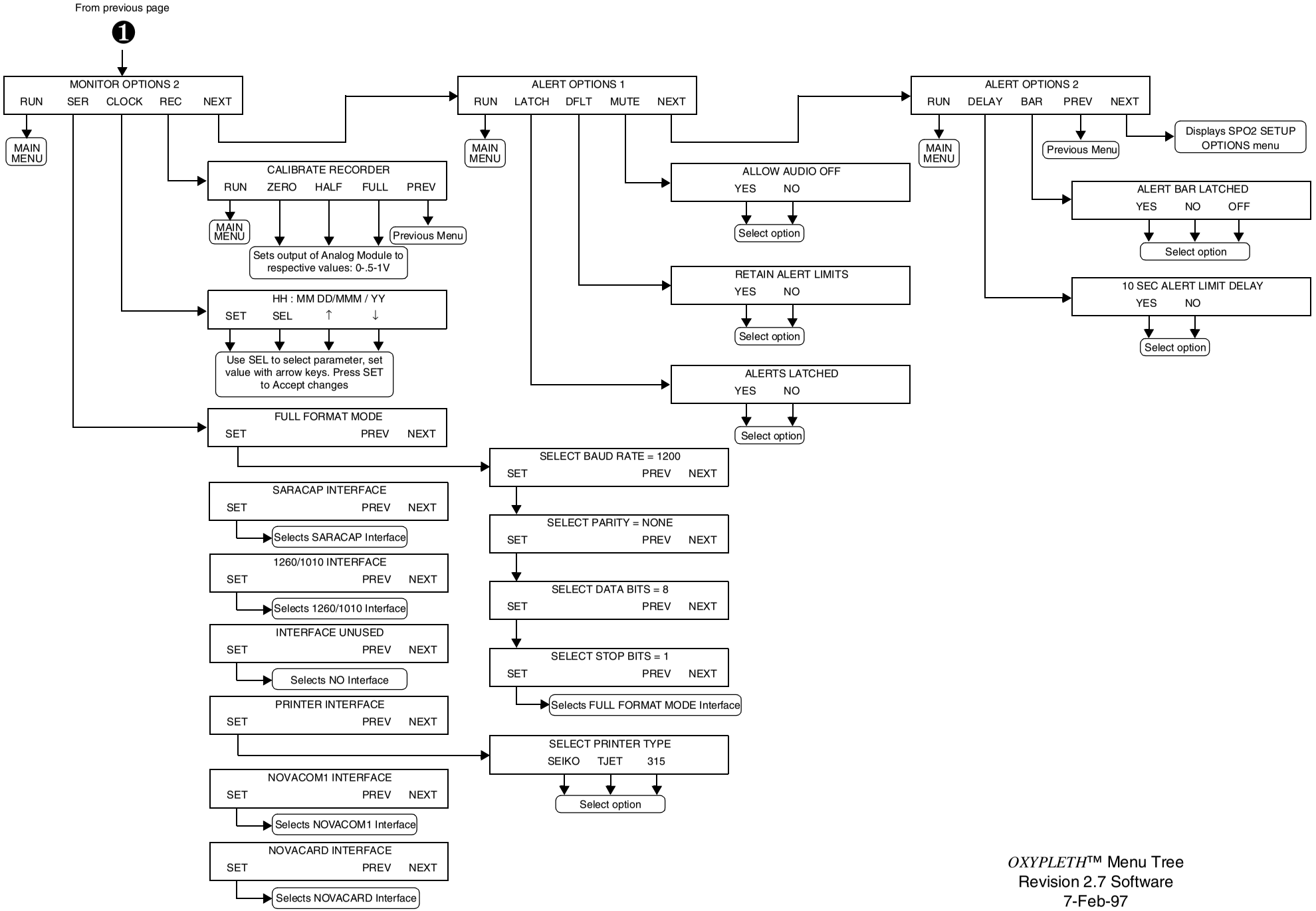




OXYPLETH™ Menu Tree
Revision 2.7 Software
7-Feb-97

OXYPLETH™ Menu Tree
Revision 2.7 Software
7-Feb-97


message center
ALRT TRND MENU
Press and hold MENU key for 5 seconds
SPO2 SETUP OPTIONS
RUN MODE IABP SIZE NEXT
MAIN MENU
WAVEFORM AUTO SIZE
ON OFF
Select the option to have the Pleth waveform automatically scaled to fit in the display window
IABP MODE AVAILABLE ?
YES NO
Allows IABP mode, if selected the IABP softkey will appear in the SYSTEM OPTIONS
SELECT OPERATING MODE
NICU ICU ANST SLEEP PREV
Previous Menu
Select desired mode
SPO2 TIMERS
RUN HELD SPEC BAD NEXT
MAIN MENU
ALERT ON BAD SIGNAL
ON OFF
Selects the display held timer option
SPECIAL ALERT DELAY
15s 30s 45s 60s 90s
Selects the special alert delay time, current selection will flash
DISPLAY HELD TIMER
0s 15s 30s 60s
Selects the alert on bad signal time, current selection will flash
MONITOR OPTIONS 1
RUN DISP KLCK VER NEXT
MAIN MENU
Inverts display color
Displays Current Revision
1 Continued next page
SET KEYCLICK VOLUME
RUN ↑X X ↓ PREV
MAIN MENU
Varies volume from 00-07
Previous Menu



OXYPLETH™ Menu Tree
Revision 2.7 Software
7-Feb-97

9 Electronic Theory of Operation

The electronic theory of operation of the Model 520A Pulse Oximeter monitor is detailed in the subsections below. Refer to Section 19, *Schematic and Assembly Drawings*, on page 93 for further information.

2472 Power Supply Board 9.1

The 2472 Power Supply Board contains the circuitry needed to power the monitor from the AC Mains (line voltage). The power supply board also connects to the battery and contains the battery charging circuitry.

AC Mains and Battery Operation Overview 9.1.1

The Model 520A can be powered from its internal 12 volt battery or from the AC Mains. The green ∿ (sine wave shaped) front panel indicator illuminates when the line cord is connected and the rear panel power switch is in the "|" (On) position. This indicates that AC Mains power is reaching the power supply, that the battery is being charged, and that if the monitor is turned on, it is being powered from the line voltage.

If AC Mains power is removed by unplugging the line cord or setting the rear panel power switch to the "0" (Off) position, the monitor will operate for up to four hours from its internal 12 volt lead-acid battery. As the battery voltage runs low (≈11.5 volts), the red 🔋 (battery indicator) on the front panel illuminates. At this point, the AC Mains should be reconnected to power the monitor and charge the battery.

If the monitor continues to be powered from a battery in a low voltage situation, at approximately 11 volts, a continuous alarm sounds for thirty seconds while the Message Center displays BATTERY EXHAUSTED CONNECT LINE CORD. If this alarm/message is ignored, the monitor displays will shut down and the battery indicator will flash on and off about every 5 seconds. If AC power is now restored, the monitor will re-initialize (go through the power up and self-test routines) and resume normal operation. However, continued battery operation will eventually activate a hardware low voltage circuit (≈8.5 volts) that shuts the monitor off to prevent damage to the battery. Once the unit is shut down with the hardware circuit,

the AC Mains must be connected and the front panel **POWER** key pressed before the monitor will turn back on.

AC Mains Operation 9.1.2

The AC Mains voltage enters the monitor at the rear panel Power Entry Module (PEM). This device contains a built in RFI power line filter, a double-pole single-throw switch that opens and closes both AC input lines, fuses, and an input voltage selection card.

The filtered, switched and fused output of the Power Entry Module is fed to the primary coils of the rear panel mounted system transformer, T301. The secondary output from T301 is rectified by D1 (bridge rectifier) and filtered by C1. The (loaded) DC voltage at this point is approximately 20 volts.

The 20 DC volts is fed to the 2471 main board through fuse F301 to connector E302, and is switched to the battery charging regulator IC1 (pin 5) through Q1. Biasing for Q1 is accomplished by D2, R1 and R2 when AC power is applied. When running on battery power Q1 is biased off by R1, R2 and D3, this prevents the battery from trying to power the battery charger regulator and IC2 that informs the monitor of the loss of AC.

The output of switching regulator IC1 pin4 is rectified and filtered by D4, C4 and L1 then fed to the battery through current sense resistor R3 and fuse F302 to J302 pin 1 (VBAT+). The battery float charge voltage is maintained at 13.2 volts except for fast charge which is regulated at 14.4 volts. The output is also monitored for over current conditions. These parameters are controlled by IC3 and associated circuitry. When the battery charge current exceeds 120mA of current IC3 pin 7 goes high which biases Q2 on, this in turn shorts out R12 which affects the feedback control (FB) to IC1 (pin 1). With R12 shorted out the control resistors R14 and R13 set the output voltage to 14.4 volts. When the charge current lowers IC3 pin 7 goes low which biases Q2 off, this puts R12 back into the feedback control which now consists of R12, R13 and R14 setting the voltage to 13.2 volts. When more than 600mA of current flows through R3, IC3 pin 1 shorts IC1 pin 2 to ground which shuts IC1 off until its next switching cycle, when the current reaches a safe level IC3 pin 1 allows IC1 to remain on.

The voltage switched by Q1 is also fed to IC2 as VCH (Voltage Charge). The output of this 5 volt regulator provides the LINEST (Line Status) signal to the main board at E302 pin 3. With AC applied, LINEST is high. LINEST goes low when the AC is disconnected. The LINEST line is also routed to the power on/off circuitry. See *Power On/Off Control Circuitry* on page 19.

Battery Operation 9.1.3

Without AC power there will be no secondary voltage rectified by D1. Power for the monitor will be supplied from the battery at J302 pins 1 (VBAT+) and 2

(VBAT-). The battery power will conduct through D3 and F301 to VIN at E302 pin 1 to the 2471 main board. The arrangement of R1, R2 and D2 bias Q1 off in this condition which prevents power from reaching IC1, IC2 and IC3. The output of IC1 is also protected by D5 which is now reverse biased, the bridge D1 is also reverse biased and prevents T301 from discharging the battery. With no voltage at IC2 the LINEST will be low which indicates to the main board that there is no AC power.

2726 Power Supply Board 9.2

The 2726 Power Supply Board contains the circuitry needed to power the monitor from the AC Mains (line voltage). The power supply board also connects to the battery and contains the battery charging circuitry.

AC Mains and Battery Operation Overview 9.2.1

The Model 520A can be powered from its internal 12 volt battery or from the AC Mains. The green (sine wave icon) front panel indicator illuminates when the line cord is connected and the rear panel power switch is in the "|" (On) position. This indicates that AC Mains power is reaching the power supply, that the battery is being charged, and that if the monitor is turned on, it is being powered from the line voltage.

If AC Mains power is removed by unplugging the line cord or setting the rear panel power switch to the "0" (Off) position, the monitor will operate for up to four hours from its internal 12 volt lead-acid battery. As the battery voltage runs low (<11.5 volts), the red battery indicator on the front panel illuminates. At this point, the AC Mains should be reconnected to power the monitor and charge the battery.

If the monitor continues to be powered from a battery in a low voltage situation, at approximately 11 volts, a continuous alarm sounds for thirty seconds while the Message Center displays BATTERY EXHAUSTED CONNECT LINE CORD. If this alarm/message is ignored, the monitor displays will shut down and the battery indicator will flash on and off about every 5 seconds. If AC power is now restored, the monitor will re-initialize (go through the power up and self-test routines) and resume normal operation. However, continued battery operation will eventually activate a hardware low voltage circuit (<8.5 volts) that shuts the monitor off to prevent damage to the battery. Once the unit is shut down with the hardware circuit, the AC Mains must be connected and the front panel POWER key pressed before the monitor will turn back on.

AC Mains Operation 9.2.2

The AC Mains voltage enters the monitor at the rear panel Power Entry Module (PEM). This device contains a built in RFI power line filter, a double-pole single-throw switch that opens and closes both AC input lines, fuses, and an input voltage selection card.

The filtered, switched and fused output of the Power Entry Module is fed to the primary coils of the rear panel mounted system transformer, T301. The secondary output from T301 is rectified by D1 (bridge rectifier) and filtered by C1. The loaded DC voltage at this point is approximately 20 volts.

The 20 DC volts is fed to the main board through fuse F301 to connector E302, and is switched to the battery charging regulator IC1 (pin 5) through Q1B. Biasing for Q1B is accomplished by C2, R1, R2, C8 and Q1A when AC power is applied. When running on battery power Q1B is biased off by R2 and Q1A, this prevents the battery from trying to power the battery charger regulator and IC2 that informs the monitor of the loss of AC.

The output of switching regulator IC1 pin4 is rectified and filtered by D4, C4 and L1 then fed to the battery through current sense resistor R3 and fuse F302 to VBAT+ (J302 pin 1). The battery float charge voltage is maintained at 13.2 volts except for fast charge which is regulated at 14.4 volts. The output is also monitored for over current conditions. These parameters are controlled by IC3 and associated circuitry. When the battery charge current exceeds 120mA of current IC3 pin 7 goes high which biases Q2 on, this in turn shorts out R12 which affects the feedback control (FB) to IC1 (pin 1). With R12 shorted out the control resistors R14 and R13 set the output voltage to 14.4 volts. When the charge current lowers IC3 pin 7 goes low which biases Q2 off, this puts R12 back into the feedback control which now consists of R12, R13 and R14 setting the voltage to 13.2 volts. When more than 600mA of current flows through R3, IC3 pin 1 shorts IC1 pin 2 to ground which shuts IC1 off until its next switching cycle, when the current reaches a safe level IC3 pin 1 allows IC1 to remain on.

The voltage rectified by D1, D2 and filtered by C2 is fed to IC2 as VCH (Voltage Charge). The output of this 5 volt regulator provides the LINEST (Line Status) signal to the main board at E302 pin 3. With AC applied, LINEST is high. LINEST goes low when the AC is disconnected. The LINEST line is also routed to the power on/off circuitry.

Battery Operation 9.2.3

Without AC power there will be no secondary voltage rectified by D1. Power for the monitor will be supplied from the battery at J302 pins 1 (VBAT+) and 2 (VBAT-). The battery power will conduct through D3 and F301 to VIN at E302 pin 1 to the main board. R2 and Q1A bias Q1B off in this condition which prevents power from reaching IC1, IC2 and IC3. The output of IC1 is also protected by D5 which is now reverse biased, the bridge D1 is also reverse biased and prevents T301 from discharging the battery. With no voltage at IC2 the LINEST will be low which indicates to the main board that there is no AC power.

2471 & 2775 Main Board 9.3

The Main Board contains all the analog and digital circuitry that controls the sensor, external communication and front panel display. The isolated power supplies, microprocessor circuits and memory are all contained on this board. The earlier 2471 Main Board and newer 2775 Main Board are identical with exceptions noted in the text.

Power On/Off Control Circuitry 9.3.1

The Model 520A power on/off control circuitry consists of the VBACK supply (regulated by IC12), IC10, IC11 and the **POWER** key. (See page 4 2471 schematic, page 4 on 2775 schematic.)

When the battery or AC Mains is first applied to the power supply board (via VIN J102 pin 1), VBACK goes to +5 volts, provides power to IC10 and IC11, and through the C26 and RP4 (pins 3,4) network at IC10 pin 8, sets IC10 pin 2 to a logic Low.

The ON/OFF line is brought Low each time the front panel **POWER** key is pressed. This sends the output at IC11 pin10 High. This Low-to-High transition clocks the (#1) D flip-flop portion of IC10. The /Q1 output at IC10 pin 2 goes High and with each successive press of the **POWER** key, this output toggles to the opposite level (Low or High). A High turns the Model 520A on and a Low shuts it off.

While the /Q1 output at IC10 pin 2 is High, the MOSFET Q7 is turned on and pulls the gate of MOSFET Q8 to ground, thus causing Q8 to conduct as well. With Q8 conducting, the currently active monitor power source—either the AC Mains derived supply or the battery supply will flow through Q8 to the voltage input (pin 7) of the Pulse Width Modulator IC9. The output IC9 pin 6 will oscillate (at the frequency set by R13 and C15). This causes Q5 to switch on and off and provide a path to ground through the primary coils of T1 for the supply (Mains or battery) at T1 pin 12. Current flowing in the primary is measured at IC9 pin 3 and the duty cycle of the pin 6 output will vary with the load on the transformer.

Current flow in the transformer primary induces current in the three secondary coils and creates the ± 12 volt analog supplies (+V12 and -V12), the VRAWI that powers the isolated RS232 circuitry, and the +5 volt VCC supply that power the remaining circuits in the monitor. The Model 520A turns on. The +V12 and -V12 supplies are rectified and filtered by D2, D4, C10, C11, C12 and C13. The +V12 is regulated by IC7 and the -V12 by IC8. The VDD supply is rectified by D3, filtered by L1, C9 and C20 and fused at F1, and in addition, a feedback loop to IC9 contains VR1 which is factory adjusted to produce a +5.00 volt ± 0.05 volt VCC supply (measured under load).

Once the monitor powers up, a SYNC signal toggles Q9 on and off causing a timing pulse to be transmitted across C19 and C15 to the input at IC9 pin 4. This has the

effect of synchronizing the output of the pulse width modulator with the data sampling operations of the analog board and keeps power supply switching spikes from interfering with those operations.

Power Supplies 9.3.2

The secondary pins 7, 8, 9 of T1 form a center tap transformer, the voltage is rectified by D2 and D4 then filtered by C10, C11, C12 and C13. The dual 12 volt supplies, +V12 and -V12 which are generated from this voltage are regulated by IC7 and IC8 respectively. The secondary winding of pins 5 and 6 of T1 are rectified by D3 and filtered by C9, L1 and C20, this voltage designated as VCC (+5 volts) acts as reference for IC9, supplies power for the opto isolator non-isolated side and powers other circuitry on the board.

The secondary winding consisting of pins 2 and 3 are rectified and filtered by D1 and C1. The rectified voltage at this point is approximately 7 volts DC and is regulated to 5 volts by IC2. This isolated supply powers the isolated portion of the opto-isolators and the RS232 driver chip IC1. The unregulated voltage VRAWI is sent to the rear panel connector J101.

The backup voltage (VBACK) is regulated by IC12 from the VIN supply. Capacitors C22 and C27 serve as filters and D17 allows VCC to power VBACK circuitry when the monitor is on. At this point D18 is biased off so IC12 is idle. When the monitor is turned off and VCC collapses D18 is then forward biased and IC12 now supplies VBACK circuitry, D17 at this time is reverse biased and prevents power from reaching VCC.

The saturation sensor LEDs derive their power (LEDSRC) from the current regulator IC32. (See sheet 3 on 2471 schematic, page 2 on 2775 schematic.) Resistor R31 limits the maximum current draw to 45 mA (nominal draw 35 mA). Regulator output is filtered by C85 and L2. The charge stored on capacitor C1 supplies the 290-350 mA peak currents that can occur when the sensor LEDs are turned on. Diode D12 prevents the regulator output from exceeding +7.5 volts while the fuse, F2, provides current limit protection in the event of a regulator circuitry failure. The RP10 (pins 1,8 and 5,6) divider network provides the CPU (via IC33) with a means to monitor the LEDSRC status.

The +VA and -V12 supplies are regulated to +V5 (+5 volts) and -V5 (-5 volts) by IC44 and IC43 respectively. These supplies are used by the 20 bit ADCs, the 8 bit ADC and other circuits associated with them.

Voltage References 9.3.3

A +2.5 volt precision reference supply, generated by IC35 from the 12 volt +V12 supply, is used as a reference voltage for the ADC chips IC37 and IC34.

The +2.5 volt output from IC35 pin 6 is fed to the non-inverting input of amplifier IC36 pin 3. Resistors R32 and R33 combine for a gain of 1.617 that provides a +4.096 volt reference (approximately) supply, 4VREF, at IC31 pin 1.

The 4VREF is fed to IC30 pin 13 which is set up as a unity gain inverting buffer amplifier, therefore the output at IC30 pin 14 is -4 volts. This -4 volts is used by IC29 as a reference voltage for VLED (Voltage LED) and CNTRST (Contrast) controls. (See sheet 4 on 2471 schematic, sheet 3 on 2775 schematic.)

Preserving RAM and Real Time Clock Data 9.3.4

The NAND gate output at IC11 pin11 will be Low when the monitor is on (IC10 pin 2 is High) and High when the monitor is off (IC10 pin 2 is Low). (See sheet 4 of 5 on schematic.) This PWRON* (Power On) signal is used to prevent corruption of RAM and clock data when the monitor is turned off. It does this by going High and therefore denying CPU access to the RAM and clock chips so that as the power supplies crash when the monitor is turned off, the CPU cannot send erroneous data to the chips.

Whenever the CPU is writing information to the RAM or Real Time Clock chips, the CPU momentarily sends the OFFDIS (Off Disable) line High. The High going level appears at IC11 pin 2. Since the monitor is powered on, IC11 pin1 will be High. This means IC11 pin3 momentarily goes Low, Q6 starts to conduct and IC10 pin 4 goes High. In this reset condition the /Q1 output #1 flip-flop of IC10 (pin 2) will be held high even if the user presses the **POWER** key and clocks the flip-flop. In effect, the CPU is not allowing the monitor to be turned off. The Low at IC11 pin3 will last for the duration of the RC time constant set by C21 and RP4 (pins 5,6). These values were chosen to produce a time-out longer than the time necessary to complete the write to RAM or Real Time Clock operation. After the RC time-out, IC10 pin 4 returns Low and a press of the **POWER** key will toggle the /Q1 output of IC10 and the monitor will turn off. This is done to prevent corruption of RAM and Real Time Clock data.

Low Battery Voltage Shutdown 9.3.5

The CPU monitors the battery voltage and provides the user with a low battery indicator (🗀), messages and alarms. However, if these are ignored, a hardware circuit will take over and shut off the monitor before the battery is damaged.

The pulse width modulator IC9 requires at least 7.6 volts at pin 7, its voltage supply, in order to operate. This pin typically draws 10 mA of current. The resistance of the R63 and Q8 combination is approximately 114 ohms. This equates to a voltage drop of approximately1.14 volts. Therefore if the battery voltage drops under 9.0 volts (approximately), IC9 will not have sufficient voltage to operate and will shut down. Shutdown of IC9 stops current flow through transformer T1 and the secondary supplies shut down, effectively turning off the monitor.

When IC9 shuts down, its VREF output at pin 8 is pulled Low. This forward biases D6 and causes the NAND gate output at IC11 pin4 to go High. The #2 flip-flop of IC10 is clocked, and the High at the D2 input (because /Q1 is High) is transferred to the Q2 output at pin 13. The High at pin 13 Sets the #1 flip-flop causing the /Q1 pin 2 output to go Low. This Low shuts off both MOSFETs Q7 and Q8, thereby blocking any supply voltage from IC9 pin 7. Normally, pressing the front panel **POWER** key would clock flip-flop #1 (at pin 3) and return the pin 2 output High—but the High output at pin 13 keeps the #1 flip-flop Set—and the **POWER** key has no effect.

If at this point the AC MAINS is reconnected, MOSFET Q8 continues to block current from IC9 pin 7 and the monitor remains off. Connecting the AC Mains does however send the LINEST signal High. This High Line Status signal is brought to IC10 pin10 where it Resets the #2 flip-flop, sending IC10 pin 13 Low and removing the Set condition from flip-flop #1. Now, if the front panel **POWER** key is pressed, flip-flop #1 is clocked, IC11 pin11 goes High, MOSFETs Q7 and Q8 turn on, the supply to IC9 pin 7 is restored, the pulse width modulator restarts, energizes T1, and the monitor turns back on.

Timing Sequencer 9.3.6

A 14 stage divider, IC39, acts as a timing sequencer. (See sheet 3 on 2471 schematic, sheet 2 on 2775 schematic.) A 3.276 MHz crystal Y2, provides a Clock Sequence (CLKSEQ) to IC39 pin 10. The IC39 pin 11 RESET input line resets IC39 on monitor power up.

The IC39 pin 9 Q1,output provides a clock input signal to the tone generator board located at IC27. The IC39 pin 3 Q14 output provides a 5 ms interrupt (INT5MS) for IC18. The Q4-Q11 outputs of IC39 become inputs to the Data Sampling Controller IC42.

Data Sampling Controller 9.3.7

The IC39 Timing Sequencer's Q4-Q11 outputs become inputs to IC42, a PEEL (Programmable Electrically Erasable Logic) device. The PEEL uses the CLK and D0-D6 inputs, and the SC1 and SC2 inputs, to control data sampling by providing sensor LED drive signals and demultiplexing for the signals returning from the saturation sensor.

The waveforms in Figure 3.(with the exception of CLK) are only valid when both the SC1 and SC2 inputs are low. The System Calibration inputs (SC1 and SC2) generated by the microprocessor, are kept low, except that they are toggled high/

low, during a Probe Off Patient alert, and during a system power up self-test. See *Calibrating the 20-Bit Analog-to-Digital Convertors* on page 25.

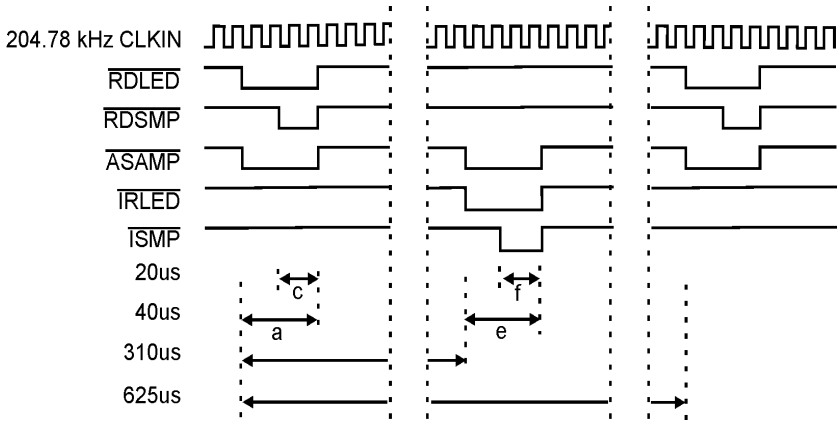


Figure 3. Figure 1. Front-End Timing

The data sampling sequence consists of:

a. turn on the Red LED (RDLED*) and the Analog Sample line (ASAMP*)

c. sample the Red LED return signal (RDSMP*)

e. turn on the Infrared LED (IRLED*) and the Analog Sample line (ASAMP*)

f. sample the Infrared LED return signal (ISMP*)

h. turn off the Infrared LED, the Analog Sample line, and stop sampling

i. repeat the process starting at step a.

The Analog Sample (ASAMP*) line is used to nullify the effects of any ambient light signals returning from the sensor. See *Sensor Photodiode Return Path* on page 24.

The IC42 INSIG* and SIGND* outputs are used in conjunction with the SC1 and SC2 inputs. See *Calibrating the 20-Bit Analog-to-Digital Convertors* on page 25.

The IC42 pin 14 external sequencer (SYNC) line is equivalent to the PEEL's D1 input. It provides a "sync" pulse to the pulse width modulator on the power supply board in order to keep power supply switching spikes from interfering with data sampling operations.

Sensor LED Drive Circuits 9.3.8

The VLED line voltage is derived from IC30 pin 8 which is controlled by the Digital to Analog Converter IC29. (See sheet 4 on 2471 schematic, sheet 3 on 2775 schematic.) When address line A0 is high (IC29 pin 6) and both WR* (IC29 pin 16) and DACCS* (IC29 pin 15) are low the D/A Converter is enabled. The data on lines

D0-D7 (IC30 pins 14-7) now control the output voltage of IC30 pin 8 (VLED) based on the VREFB voltage on IC29 pin 18.

When the RDLED* signal at IC42 pin 18 goes low (logic 0), Q14 turns off and the Red LED signal (VLED from IC30 pin 8) at R37 is divided by R37 and R41, finally causing IC36 pin8 to go high. This positive output turns Q11 on and current flows from the LED source (LEDSRC), through the Red LED in the sensor (it turns on) returning as LED1SK (LED1 sink) across Q11 and the current limiting resistor R53 to ground. (See sheet 3 on 2471 schematic, sheet 2 on 2775 schematic.)

When RDLED* returns high (logic 1), Q14 is biased on, forcing IC36 pin8 to ground potential: Q11 is biased off, and as a result, the Red LED in the sensor is also off.

The Infrared LED drive circuit operates in the same manner as the Red LED drive discussed above. The IRLED* signal at IC42 pin 17 activates Q13 the LED2S signal causes a positive signal at IC36 pin 14, and current can flow from the LEDSRC supply through the sensor's Infrared LED, Q12, and the current limiting R52 to ground.

Sensor Photodiode Return Path 9.3.9

Light, from the sensor's Red or Infrared LED, shines through the pulsating vascular bed (the patient's finger, toe, etc.) placed between the LEDs and the photodiode. Some of this light emerges from the tissue and impinges on the photodiode, causing the photodiode to conduct current. IC40 pins 1-3 is set up as a differential amplifier that converts this input current to a voltage at the amplifier output. The sensors are wired such that photodiode current produces a positive voltage at IC40 pin 1[1].

The voltage at IC40 pin 1 is presented to an analog switch IC41 pin 6. This switch is controlled at pin8 by INSIG* (Input Signal) from IC42, and will be closed (IC41 pins6 and7 connected) except if the monitor is in a Probe Off Patient condition or is undergoing its Self-Test at system power up. The switch IC41 pins 9-11, controlled from SIGND* (Signal Ground) at IC42 will be open (no connection between IC41 pins10 and 11) except as noted above for the switch at IC41 pins 6-8. As a result, the IC40 pin 1 voltage passes undisturbed to the high pass filter consisting of R59 and C90.

As shown in Figure 3., the ASAMP* signal is active whenever either sensor LED is turned on. This causes Q15 to turn off and the charge at C90 passes through the unity gain buffer to IC40 pin 7.

If the signal at IC40 pin 7 is the product of the Red LED being turned on, then RDSMP* from IC42 pin 12 will go low and close the switch at IC41 pins 2-3, thereby presenting the signal to a sample and hold circuit consisting of R54 and

1. The Model 520A uses SuperBright™ sensors. If a non-SuperBright™ sensor is connected, IC40 pin 1 will go negative—a condition that causes an "Incompatible Probe" message to be displayed.

C100 (that maintains the signal until next sample pulse arrives), a gain stage, (IC38 pin 1), a filter/divider network (C87, R45 and R46), and finally, to the Red channel Analog-to-Digital Convertor (ADC) IC34.

If the signal at IC40 pin 7 is the product of the Infrared LED being turned on, then ISMP* from IC42 pin 13 will go low and close the switch at IC41 pins 14-15, thereby presenting the signal to a sample and hold circuit consisting of R55 and C96 (that maintains the signal until next sample pulse arrives), a gain stage, (IC38 pin 7), a filter/divider network (C88, R49 and R50), and finally, to the Infrared channel Analog-to-Digital Convertor IC37.

Again referencing Figure 3., the ASAMP* line returns to a logic high when neither LED is being driven, causing Q15 to turn on. With Q15 conducting, any charge at C90 is discharged to ground and the next pulse will charge C90 from a known level. If it were not for Q15, any charge remaining on C90 from the previous pulse or from ambient light reaching the photodiode would be added to the charge from a new pulse—creating measurement errors.

Calibrating the 20-Bit Analog-to-Digital Convertors 9.3.10

The 20-bit ADCs are calibrated as part of the system self-test which occurs each time the monitor is turned on. At power up, the microprocessor sets the CAL line high. The System Calibrations input SC1 is set high and SC2 is reset to a logic low. The CS5503 ADC will not operate while the CAL line is high. On the falling edge of the CAL signal, the ADC will initiate a calibration cycle determined by the state of the SC1 and SC2 inputs.

The high at SC1 and the low at SC2 cause the Data Sampling Controller, IC42, to set INSIG* high and reset SIGND* to a logic low. The high INSIG* opens the switch at IC41 pin8 so that IC41 pins 6 and 7 are no longer connected—disconnecting the returning photodiode signal from the rest of the circuitry. The low SIGND* signal closes the switch at IC41 pin9 and as a result, the input to the C90-R59 high pass filter (and thus the entire ADC input circuitry) is brought to ground potential.

The CAL line (which went high at power up) is reset low and ADCs IC34 and IC37 begin their calibration cycles. Because the analog input circuitry is grounded via SIGND*, only circuit offset voltages can be present at the (pin 9 AIN) input. The calibration cycle sets the ADC “zero” point to equal this voltage, thus compensating for any circuitry offsets. The ADC then sets its “full scale” point to equal the voltage at its VREF (pin 10) input. This completes the calibration cycle.

The ADC can now start sampling its input and converting it to a 20-bit digital word. The processor resets SC1 to a logic low, causing IC41 pin9 to open and IC41 pin8 to close. The photodiode signal can now reach the ADCs. See *Sensor Photodiode Return Path* on page 24.

20-Bit Analog-to-Digital Conversion 9.3.11

Data from the Red and Infrared channels is sampled by the 20-bit measurement ADCs, IC34 and IC37 respectively. The analog input at pin 9 is converted to a digital representation with 20-bit resolution based on the input magnitude.

The CS5503 convertor continuously samples its input, converts the value to a digital word, puts the word in its output buffer (overwriting previous buffer contents), then repeats the process by again sampling its input. The frequency of the sample/convert/overwrite-buffer sequence is based on the 3.2768 MHz clock signal at the ADC pin 3 (CLKSEQ) input.

The microprocessor starts a read cycle of the Infrared channel by bringing IC37 pin 16 (Chip Select Channel 1) low. A Red channel read starts when IC34 pin 16 (Chip Select Channel 2) is brought low.

On the falling edge of the ADC's CS*, the output word's MSB (most significant bit) appears at the pin-20 SDATA (Serial Data) output. The SDATA line connects directly to the microprocessor's serial input (RXS) pin. The remaining bits (in descending order) are output from SDATA with subsequent falling edges of the Serial Clock (SCLK) input at pin 19. The SDATA output automatically goes to a 3-state (high impedance) condition after completing a word transmission, thus freeing the data line for other uses (i.e., the other ADC channel).

The Serial Clock speed is controlled through the digital board PEEL IC18. This clock rate is significantly slower than the ADC sampling rate. As a result, the ADC rewrites its output buffer with new information at a faster rate than the data can be read from the buffer. No conflict occurs, however, because while CS* is low (during the read cycle), the ADC does not update its output buffer—the current word is not overwritten. After the processor receives the entire word, it allows the convertor's CS* to return high, and the ADC resumes its sample/convert/overwrite-buffer cycle.

Sensor Status Decoding and Conversion 9.3.12

The microprocessor monitors several sensor parameters in addition to the Red and Infrared data channels. It monitors the status parameters, as well as the voltage of the monitor's internal battery.

The 8-to-1 multiplexor, IC33, decodes the A0AUX-A2AUX input address lines and connects one of eight status parameter inputs (labeled channels 0-7 at IC33) to the multiplexor output at IC33 pin 3. Resistor R29 and diode D13 prevent negative voltages from reaching the input to the analog-to-digital convertor, IC31.

IC31 is an 8-bit analog-to-digital convertor with a serial data output. While the IC31 Chip Select ($\overline{CS}$) input is high, the CLK input and DOUT output are in 3-state mode. When $\overline{CS}$ is brought low (under processor control), the most significant bit (D7) of the *PREVIOUS* data conversion becomes available at the DOUT pin. The

remaining bits (D6-D0) are shifted out on subsequent falling edges of the CLK input. On the clock pulse following the one that shifts out the least significant bit (D0), the CLK and DOUT lines are returned to 3-state and the ADC performs a new conversion based on the input it receives from the IC33 channel selected by the A0AUX-A2AUX input address lines.

The ADC sample/convert/store-result cycle is based on internal chip timing and not the CLK input which (along with $\overline{CS}$) only controls serial data output. Thus the $\overline{CS}$ line is free to return high once the ADC cycle begins.

Sensor Status Parameters 9.3.13

The sensor (and battery) status parameters input to the multiplexor IC33 are described below. Note that channel number refers not to the IC33 pin number, but to the signal label (e.g., channel I0 signal resides at IC33 pin 13).

Channel I0: ADCV12.
This is an extra input to the multiplexer IC33 pin 13. It is unused as of this writing.

Channel I1: Auxiliary Input.
This is an extra input to the multiplexer IC33 pin 14. It is unused as of this writing.

Channel I2: Photodiode DC Level.
Resistors R40, RP8 (pins 1, 2) and capacitor C97 form a voltage divider and low pass filter that provide a measure of the mean DC level at the output of the photodiode current-to-voltage amplifier IC40 pin 1. This channel (IC33 pin 15) is used in determining ambient light interference. If this line is examined while the sensor's Red and Infrared LEDs are turned off, then any DC level at IC40 pin 1 must be the result of ambient light impinging on the photodiode. If the DC shift is in excess of limits set in the software, a Light Interference message appears on the monitor's display.

Channel I3: Sensor LED Supply Voltage.
This channel, at IC33 pin 12, monitors the sensor LED supply voltage through a voltage divider consisting of RP10 (pins 5, 6) and RP8 (pins 1, 8). If a fault occurs that causes the LED supply fuse F2 to blow, or if the sensor wires are shorted, this channel reports the condition and the Message Center displays PROBE FAILURE.

Channel I4: Incompatible Probe Detection
The input at IC33 pin 1 provides the processor with an incompatible probe indicator (words probe and sensor are interchangeable). The photodiode output voltage at IC40 pin 1 will be positive if a SuperBright™ sensor is connected to the monitor. This positive signal passes through the high pass filter of C73 and RP10 (pins 7, 8) to the amplifier inverting input IC36 pin 6, where it is summed with the -5 volt output from IC43. The resultant voltage at IC33 pin 1 will be approximately +2.81 volts with no photodiode input. This voltage drops as the (positive) photodiode signal at IC40 pin 1 increases. If the IC40 pin 1 signal goes negative, as would happen if a non-SuperBright™ 8600 series sensor were connected to the monitor,

the cumulative effect of the -5 volts and the negative photodiode signal passing through D14 and R34 would be to send the IC36 pin7 output to its positive rail (+12 volts). The processor recognizes this higher voltage and causes an INCOMPATIBLE PROBE message to displayed in the Message Center.

Channel I5: Infrared LED Cathode Voltage.
A low pass filter consisting of RP10 (pins 3, 4), RP8 (pins 1, 7) and C89 provides a means to measure the cathode voltage of the sensor's Infrared LED. If the channel at IC33 pin 5 is sampled the monitor can determine if the LED is open circuit (zero volts at IC33 pin 5) or operational (approximately 2.5 volts at IC33 pin 5). If not operational, display messages such as PROBE I.R. LED FAILED or ERROR - FAULTY PROBE are generated.

Channel I6: Battery Supply Voltage
The monitor's internal battery voltage is divided down by RP3 (pins 7, 8) and RP8 (pins 1, 5). The voltage at IC33 pin 2 is monitored and if its magnitude is less than a predetermined value (encoded in the software) the monitor lights and/or flashes its front panel battery indicator. This provides the user with a low battery warning.

Channel I7: Red LED Cathode Voltage.
A low pass filter consisting of RP10 (pins 1, 2), RP8 (pins 1, 8), and C92 provides a means to measure the cathode voltage of the sensor's Red LED. If the channel at IC33 pin 4 is sampled the monitor can determine if the LED is open circuit (zero volts at IC33 pin 4) or operational (approximately 2.5 volts at IC33 pin 4). If not operational, display messages such as PROBE RED LED FAILED or ERROR - FAULTY PROBE are generated.

Microprocessor 9.3.14

A Hitachi HD64180RP microprocessor directs the actions of the Model 520A Pulse Oximeter. (See sheet 2 on 2471 schematic, sheet 1 on 2775 schematic.) The processor, IC16, is operated at 6.144 MHz (half the12.288 MHz frequency of crystal Y1), has an 8-bit data bus and a 19-bit address bus (the 520A uses only 18-bits). The microprocessor also provides two asynchronous serial communication channels, a clocked serial I/O port and various interrupt and control signals. The +5 volt VCC supply to the processor is first sent through inductor FB1, a ferrite bead, before powering the chip at IC16 pin 32.

Memory 9.3.15

The Model 520A system software is located at IC17, a 27C010 EPROM. The 32 K byte RAM, IC20, stores trend data, system power up settings (averaging times, serial output parameters, etc.), and provides an area for system (scratchpad) memory requirements. Since IC20 is powered from the VBACK supply, RAM memory is retained when the monitor is turned off and it becomes available again when the monitor is turned back on.

The ROM at IC17 is read when its Chip Enable line (IC17 pin 22) is brought low by the ROMCS* signal at IC25 pin 3, and the processor brings its Read line (IC16 pin 63) low—thereby activating the ROM Output Enable line at IC17 pin 24. Under these conditions, ROM data from the specified address bus location is made available to the data bus for use by the processor.

The RAM (IC20) is activated when its Chip Select line RAMCS* (IC20 pin 20) is brought low, via IC25 pin 8. When the ME* line at IC25 pin 5 is low, and the inverse of address line A17 at IC25 pin 4 is low, output pin 6 of IC25 will go low. This in turn will drive IC25 pin 10 low, with PWRON* low at IC25 pin 9, IC25 pin 8 will be low (RAMCS*). If at that time, $\overline{OE}$ (IC20 pin 22) is low, a RAM Read occurs, whereas a RAM Write will occur if $\overline{WE}$ (IC20 pin 27) is low.

Real Time Clock (RTC) 9.3.16

A Real Time Clock provides the Model 520A the ability to time stamp collected (printed) trend data. (See sheet 4 on 2471 schematic, sheet 3 on 2775 schematic.) The 32.768 kHz crystal, Y3, provides the timing signals for the clock chip, IC24, which is powered from the VBACK supply so that the clock can continue to keep time when the monitor is turned off (provided the monitor's 12 volt internal battery is connected and maintains at least a nominal charge).

The RTC is activated when its Chip Select line (CS0*) at IC24 pin 2 is brought low. With the monitor on PWRON* will be low (IC25 pin 13), the RTC* line will be brought low by the processor through IC22 pin 14, these lines drive RTCCS (Real Time Clock Chip Select IC25 pin 11) low. If at this time, the RD* (IC24 pin 8) input is low, a RTC Read occurs, whereas a RTC Write will occur if the WR* (IC24 pin 10) input is low. Addressing is handled by A0-A3 (pins 4-7) and data I/O through D0-D3 (pins 14-11).

Sound generator 9.3.17

The programmable tone controller IC27 is replaced with the Tone Generator Replacement board 2755-01, this is used to drive the monitor's audio circuit. The tone generator is clocked by IC39 pin9 from the 1.638 MHz signal, Q1. The tone generator is enabled by the processor when IC22 pin12 is brought low. While CE* is low, WR* is brought low and data bus information including frequency (pitch) and attenuation (volume) is accepted by the tone generator. The Ready signal (IC27 pin 4) goes low while accepting data and the processor is put into a Wait state until IC27 finishes its task; then Ready returns high and the processor continues its operations.

The AUDOUT output at IC27 pin 7 drives the audio amplifier IC26. The amplifier output is coupled through capacitors C55 and brought to J109 as the SNDOUT (Sound Out) line. The speaker which is mounted in the chassis is connected to J109, LS1 is not installed on the 2471 Main Board.

Keypanel Interface 9.3.18

The12 keys (switches) on the Model 520A front panel are connected to the 2471 Main Board through a ribbon cable at J104. Each key (except **POWER**) is connected to an 8-bit latch (either IC14 or IC15). When any of these keys is pressed, the corresponding latch input is brought low. The processor continually reads the status of these latch outputs, the RDKEY* enables IC14 when low and the RDKEY_2* line enables IC15 when brought low.

The **POWER** key ON/OFF signal is sent through J104 pin 15. The AC Line Status signal, LINEST, is generated by the power supply, and is high (+5 volts) when the monitor is connected to the AC Line (Mains) and the rear panel switch is set to "|". This +5 volt level is sent to LED D2 (the green ∿ indicator) on the keypanel via J104 pin 16. The LINEST signal is also input to the latch at IC14 pin 8 so that the CPU can detect if the unit is operating on AC line power (IC14 pin 8 high) or on battery power (IC14 pin 8 low). Diode D9 keeps current from backfeeding into IC14 when the monitor is turned off but still connected to the AC line.

The 2MIN (D3), AUDIO OFF (D4), ALERT (D5), and LOW BAT (D1) LEDs are driven by the 8-bit latch IC13. When each of the corresponding signals is driven high the appropriate LED on the keypanel is illuminated. See *I/O Device Controller* on page 31.

Display Interface 9.3.19

The display is connected to the 2471 Main Board at J107. It is controlled by the processor using the RD* (Read), WR* (Write), and DISPCS* (Display Chip Select) lines. Data bits D0-D7 are used as input/output lines and A0 is used in conjunction with the RD* and WR* lines to distinguish between read and write operations as listed below.

A0	RD* Low	WR* Low
High	Status Read	Command Write
Low	Data Read	Data Write

Table 1. Display Command/Data table.

The CNTRST (Contrast) line is controlled by pressing the front panel ◐ key. When depressed and held the processor controls the digital to analog converter IC29, line A0 is brought low along with WR* and DACCS*, the data on D0-D7 controls the voltage at IC30 pin 7 which can vary from 0-4 volts. The output of IC30 pin 7, along with 4VREF feeds a summing amplifier (IC30 pins 1, 2, 3). The output of the summing amplifier IC30 pin 3 controls the base of Q10 which in turn controls the contrast of the display through a variable negative voltage.

The backlight for the display is controlled by the DSPBR (Display Bright) line. When DSPBR is high the gate of Q16 is biased off, current flows from Vcc through R51 to IC45. This sets the backlight for low illumination. The illumination of the backlight is made greater when DSPBR is made low, this biases Q16 on which essentially shorts out R51 allowing more current to flow into IC45 creating a full backlight.

I/O Device Controller 9.3.20

The A/D Converter Chip Selects, serial A/D Chip Selects, Sensor Status Decoding and NEXT* line are all controlled by IC28 when selected by the OPORT line (IC21 pin 10). The OPORT line will go high when the L1* and WR* line both go low at IC23 pins 13 and 12, this will send output pin IC23 pin 11 low which drives inverter IC21 pin 10 high enabling IC28.

A 3 to 8 decoder is used to control the DACCS*, RTC*, DISPC*, AUD*, KEYS*, L1*, L2*, 2KEYS* lines. when the IOE* line goes low and the LIR* line goes high being inverted by IC21 pin 2 and presented to IC22 pin 5 as a low enable line IC22 is enabled, Q0-Q7 will be driven low depending upon the A4, A5 and A6 lines on pins 1, 2, 3 respectively on IC22.

With the LPORT line high IC13 is enabled, this latches the data on lines D0-D7 (1D-8D pins 2-9) on its output pins 19-12 (1Q-8Q respectively), the outputs correspond to the following eight lines:
CAL-used by the A/D Convertors on power up to compensate for front end voltage offsets.
TML-Two Minute LED drives the LED on the front display.
AOL-Audio Out LED drives the LED on the front panel.
ARL-Alert LED drives the LED on the front panel.
KJL*-drives Q17 when high which in turn drives the Alert Bar LEDs via J105.
BTL-Battery Low LED on the front panel.
DSPBR-(not used on the 520A)
OFFDIS-sent to the Power On/Off section of the circuitry to prevent the monitor from being turned off while writing to RAM.

Watchdog Timer 9.3.21

The Watchdog Timer provides a system reset function in the event a hardware or software “glitch” occurs. The PEEL IC18 forms the heart of the Watchdog circuit. (See sheet 2 on 2471 schematic, sheet 1 on 2775 schematic.)

At powerup and at specific intervals thereafter, the microprocessor outputs a logic high to IC18 pin 8, WDOG (Watchdog). The WDOG signal combines with other signals within the PEEL and as a result the Watchdog Clear (WDCLR) open drain output at IC18 pin 12 is continually brought low. This discharges the capacitor C46 before it can charge up (via RP2 pins 1 and 2) past the input threshold of IC21 pin 9.

If the WDOG pulse does not appear at regular intervals, as the result of a software or hardware problem, the RC charges up and IC21 pin 8 goes low producing a Watchdog Time-out (WDTO*) input at IC18 pin 11. WDTO* combines with other signals within the PEEL and causes the open drain Master Reset (MR) output at IC18 pin 13 to be brought low.

A low MR causes C45 to discharge, forcing IC21 pin6 high. This sends a reset pulse to the system. It also sets the Reset Input (RESIN) signal at IC18 pin 9 high which causes RESET* at IC18 pin 19 to activate low. The active RESET line causes the microprocessor (IC16 pin 7) and the display module to be reset. The monitor then performs its powerup self-test routines, and if the "glitch" has been cleared, the monitor resumes normal operation. If the problem still exists, a self-test or other error should be displayed.

Serial I/O Controller 9.3.22

Digital data from the three Analog-To-Digital Convertors is read by the CPU through its clocked serial data input (RXS) at IC16 pin 52. The PEEL IC18 acts as the Clocked Serial I/O (CSI/O) Controller.

Except during powerup or Watchdog Timer reset,IC39 pin 3 provides an interrupt to the CSI/O controller in the form of a 5 millisecond period square-wave input to IC18 pin 7 (INT5MS).

On the rising edge of INT5MS, a CPU interrupt request is generated when IC18 pin 18 (CPUINIT*) goes low. The CPU responds by sending the clock input to CSI/O controller (CKS) at IC18 pin 6 low. (This CKS line is inactive high unless a serial receive operation is in progress.) The CPU also sets up the ADC decode lines AA1 and AA0 at IC18 pins 5 and 4, and as a result, one of the ADC chip select lines (CSADC1*, CSADC2*, CSADC3*) is brought low, and the CPUINIT* line is disabled.

On the rising CKS signal a CLKS output pulse at IC18 pin 14 is sent as a serial clock input to the ADC selected by the decode lines. Decode results are shown below.

AA1	AA0	Decode
0	0	Red LED 20-bit ADC
0	1	Infrared LED 20-bit ADC
1	1	Sensor Status 8-bit ADC
1	0	Internal CSI/O signal (TEND)

Table 2. CSI/O Decode Lines

Successive CKS/CLKS pulses cause the ADC data to be shifted out of the ADC (most significant bit first) along the serial data line (SDATA) to the CPU serial input (RXS) at IC16 pin 52.

After receiving the correct number of bits for the ADC being read, the CPU changes the AA1 and AA0 decode lines and exerts the Next line (NEXT*) at IC18 pin 9 low. This restarts the serial data shifting out of the newly selected ADC.

After all three ADCs have been read, the CPU sets the AA1 and AA0 decode lines to exert the internal TEND signal and set the 8-bit ADC to the next channel (so that it has time to settle before the next read of the ADC). This re-enables the CPUINIT line. At this point the CSI/O controller is reset awaiting an INT5MS pulse to begin the cycle again.

RS232 Serial Communication 9.3.23

The Model 520A supports serial (RS232) communication with external devices via the monitor's rear panel connector. Signals to and from the rear panel RS232 connector are electrically isolated from the rest of the Model 520A electronics by four opto-isolators (IC3-IC6). (See sheet 5 on 2471 schematic, sheet 4 on 2775 schematic.)

An isolated secondary coil from transformer T1 is rectified and filtered by D1 and C1 before being input to the +5 volt regulator IC2. The regulated output of IC2 is sent to pin 25 of the 25-pin D connector on the rear panel in order to power the optional Analog Module or Telemetry transmitter. The supply also powers IC1.

The Dual RS232 Transmitter/Receiver, IC1, uses a single +5 volt supply (pin 16). The two Receive (Rx) inputs can accept ±30 volt levels, while the two Transmit (Tx) lines output ±9 volt levels. The four level translators within the chip turn the RS232 level signals to 5 volt TTL/CMOS compatible levels.

Two signals lines TX0 and TX1 transmit data from the CPU across the opto-isolators ICs 3 and 4 to IC1. Here the signals are level shifted to the standard ±9 volt levels and sent to the rear panel connector.

When the CPU brings the TX0 signal at R62 Low, the LED portion of IC3 becomes forward biased and illuminates and causes the transistor portion of the device to conduct. Therefore, when TX0 is Low, IC1 pin 11 is Low and when TX0 is High, IC1 pin 11 is also High. All four opto-isolators work in the same way. IC1 level shifts its input at pin 11 and outputs RS232 standard ±9 volt levels at the TX signal at J101 pin 3. This transmit signal is used to output data to RS232 devices including the Hewlett-Packard ThinkJet Printer and the Novametrix Model 315 Printer.

The CPU TX1 signal crosses the isolation barrier at IC4. The 0-5 volt opto-isolator output at IC4 pin 5 is used to bring data to the Optional 9622-01 Analog Module. The IC4 pin 5 output is also brought to IC1 pin 10. The level shifted output at IC1 pin 7 is unused (except for factory test use).

The Receive (RX) line at J101 pin 2 and the Clear To Send (CTS) line at J101 pin 6 are input signals to the Model 520A. They are level shifted by IC1 and sent across the isolation barrier by ICs5 and 6 respectively.

The transmit signal TX1, is dedicated to communication with the Optional Analog Module (Catalog Number 9622-01) which when connected to the rear panel connector, provides analog representations of the SpO_2 and Pulse Rate values, a plethysmogram signal, and a pass through port for the RS232 connector.

The transmit output TX0 from the CPU and the Receive (RX0) and Clear To Send (CTS*) inputs to the CPU are connected to the rear panel RS232 connector.

10 Maintenance

General 10.1

This section presents recommended maintenance schedules for the Model 520A and information on general maintenance, such as battery and fuse replacement, disassembly and assembly instructions, and system software updates.

Maintenance Schedules 10.2

The electronic circuits within the Novametrix Model 520A Pulse Oximeter monitor do not require scheduled calibration or service. However, in order to maximize battery life, the monitor's internal battery should be exercised monthly. Novametrix recommends the following maintenance schedules.[1]

- Cleaning and Sterilization:
  Perform as required. See *Cleaning and Sterilization* on page 36.
- Battery Life and Maintenance:
  See *Battery Life and Maintenance* on page 37.
- Functional Test:
  The test may also be used as a "spot check" to verify system operation if reports of malfunctions are received. The test verifies overall functional integrity of the monitor and sensors. Section 12, *Functional Test*, on page 51
- Accuracy Test:
  This test, which requires the use of the Model TB500B Sensor Simulator, verifies the performance accuracy of the Model 520A. If the monitor does not pass the accuracy test, the Calibration and Adjustment test should be performed. See Section 13, *Accuracy Test*, on page 55.
- Calibration Tests:
  These tests contain information on calibrating the electronic circuits within the Model 520A and should only be performed if the monitor fails to pass the Functional and/or Accuracy Tests. Only qualified service personnel should attempt to perform the Calibration and Adjustment Test. See Section 14, *Calibration Tests*, on page 59.

1. At the customer's request, Novametrix will provide repair and calibration services under the terms of a Service Contract. Contact the Novametrix Service Department for contract details.

Cleaning and Sterilization 10.3

Model 520A Monitor 10.3.1

- Turn the monitor off and unplug from the AC (Mains) line before cleaning.
- The monitor can be cleaned and disinfected with solutions such as a 70% isopropyl alcohol, 2% glutheralhyde, or 10% bleach solution. Then wipe down with a water-dampened clean cloth to rinse. Dry before use.
- Do not immerse the monitor.
- Do not attempt to sterilize the monitor.

Finger Sensor 10.3.2

- The sensor can be cleaned and disinfected with solutions such as a 70% isopropyl alcohol, 2% glutheralhyde, or 10% bleach solution. Then wipe down with a water-dampened clean cloth to rinse. Dry before use.
- Make certain that the finger sensor windows are clean and dry before reuse.
- Do not immerse the finger sensor.
- Do not attempt to sterilize the finger sensor.
- After cleaning the finger sensor, verify that the sensor is physically intact, with no broken or frayed wires or damaged parts. Make certain that the connectors are clean and dry, with no signs of contamination or corrosion. Do not use a broken or damaged sensor or one with wet, contaminated or corroded connectors.

Y-SENSOR™ and Y-STRIP™ Taping System 10.3.3

- Do not immerse connector on the Y-Sensor.
- The Y-Sensor may be immersed—up to, but not including, the connector, in a 2% glutheralhyde solution, or 10% bleach solution. Refer to manufacturer's instructions and standard hospital protocols to determine recommended times for disinfection and sterilization.
- Rinse thoroughly with water and dry before use (do not rinse the connector).
- Do not attempt to sterilize Y-Sensor except as stated above.
- After cleaning or sterilizing the Y-Sensor, verify that the sensor is physically intact, with no broken or frayed wires or damaged parts. Make certain that the connectors are clean and dry, with no signs of contamination or corrosion. Do not use a broken or damaged sensor or one with wet, contaminated, or corroded connectors.
- Treat Y-Strip Tapes and foam wraps in accordance with hospital protocol for single-patient use items.

Battery Life and Maintenance 10.4

The monitor was shipped from the factory with a fully charged battery. Since the monitor draws some battery power even while turned off, it is recommended that the monitor be operated on line power for the first 24 hours to allow ample time for the battery to fully recharge.

The monitor may be operated on line power while the battery is recharging. Approximately 16 hours are required to fully recharge a discharged battery.

During prolonged periods of storage or shipment, the battery may discharge enough to prevent the unit from turning on while operated from battery power. If this occurs, plug in the line cord, set the switch on the rear panel to the "I" On position, ensure that the green ∿ indicator on the front panel is illuminated, and allow the monitor to charge for 24 hours before switching it on.

Mains Voltage Configuration 10.5

The rear panel power entry module indicates the mains voltage setting for the monitor. Check that the voltage is correct before attaching the AC line cord and powering the monitor. The Model 2001 can be set to operate from 100-120 VAC 50/60Hz or 200-240VAC 50/60Hz.

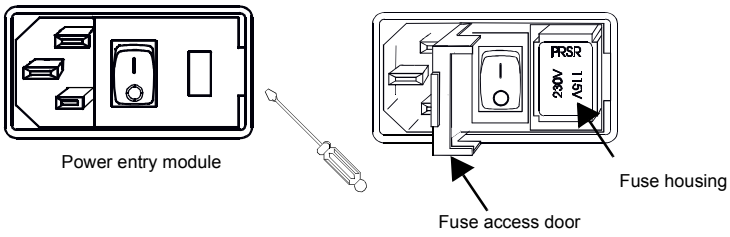
Instructions for fuse replacement and changing the mains voltage setting follow.

CAUTION: Replace fuses with same type and rating. Verify proper fuse value for mains voltage setting (see table below).

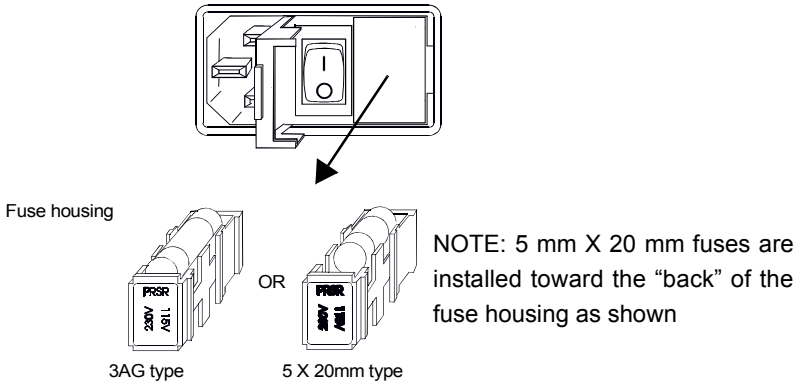
Fuse Replacement 10.5.1

1. Check that the monitor is OFF.
2. Set the rear panel power entry module switch to OFF ("O"). Remove the AC line cord from the power entry module.
3. Using a flat blade screwdriver, pry the fuse access door open to expose the fuse housing. Note the orientation of the fuse housing (this determines the mains operating voltage).

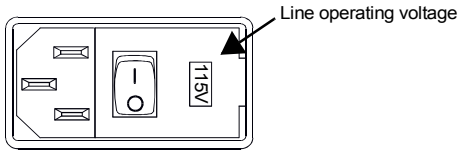
Mains Voltage	Fuses (Slo Blo)
100-120 VAC	0.5 A 250V
200-240 VAC	250mA 250V



4. Pry the fuse housing out from the power entry module.



5. Replace the blown fuse(s) with the proper type and rating.
6. Reinstall the fuse housing. When positioning the housing into the power entry module make sure that it is oriented correctly. Press the fuse housing back into the power entry module.
7. Close the fuse access door and verify that the proper mains operating voltage is displayed.



Changing the Mains Voltage Setting 10.5.2

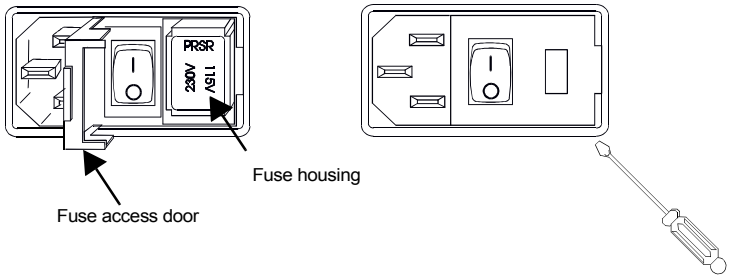
1. Check that the monitor is OFF.
2. Set the rear panel power entry module switch to OFF (“O”). Remove the line cord from the power entry module.

CAUTION: Replace fuses with same type and rating. Verify proper fuse value for mains voltage setting (see table below).

Mains Voltage	Fuses (Slo Blo)
100-120 VAC	0.5 A 250V

200-240 VAC	250mA 250V

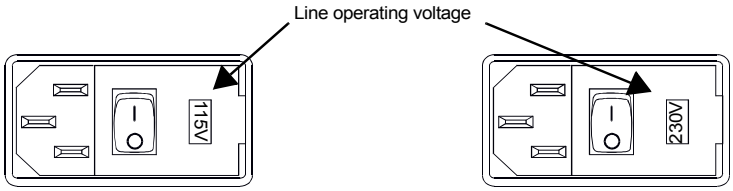
3. Using a flat blade screwdriver, pry the fuse access door open to expose the fuse housing. Pry the fuse housing out from the power entry module.



4. Install the proper type and rating fuse for the mains voltage setting required.
5. Position the housing into the power entry module so that the desired voltage is furthest away from the switch (see below).

Set for 100-120V operation Set for 200-240V Operation

6. Close the fuse access door and verify that the proper mains operating voltage is displayed.



AC Mains on older style assemblies 10.5.3

The Model 520A will operate on line voltages of 100, 120, 220 or 240 VAC ± 10% at 50/60 Hz. At 100/120 VAC,two 0.5 Amp, 250 Volt, Slo-Blo (time delay) AC Mains fuses are required, while Two T 250 mA, 250 Volt fuses are required when operating at 220 or 240 VAC. For continued protection against fire hazard, replace only with fuse(s) of the same type and rating. The rear panel Power Entry Module (PEM) houses the AC Mains fuses and is where the input voltage is selected. It also houses the AC Mains Power switch: set to “l”, AC Mains power is presented to the internal circuitry; set to the “0” position, power does not pass through the PEM.

Replacing the AC Mains Fuse(s) 10.5.4

1. Turn off the Model 520A. Set the rear panel AC Mains power switch to "0" and disconnect the line cord from the monitor.
2. Place a screwdriver into the Fuse Access Slot and pry open the Fuse Access Door.

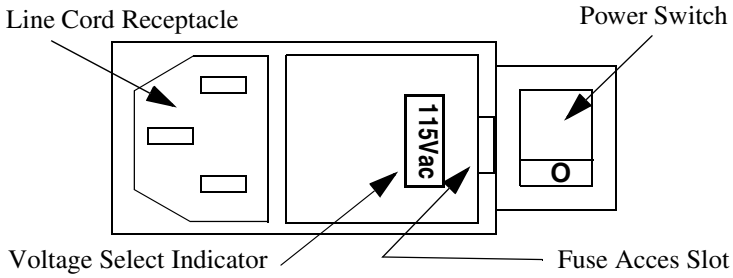


Figure 4. Power Entry Fuse Access Door Opening

3. With the Fuse Access Door open pull the fuse(s) out by pulling on the point of the arrow indicator, the fuse holder assembly will slide out.

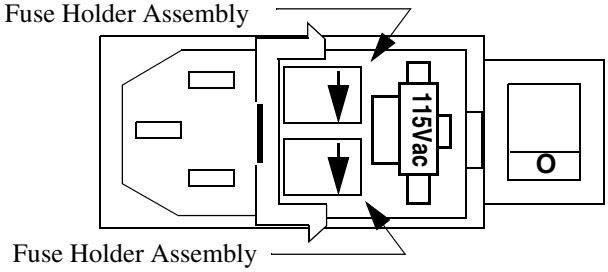


Figure 5. Fuse Removal

4. After replacing the fuse(s), snap the fuseholder assemblies into the PEM and shut the Fuse Access Door.

Changing the AC Mains Voltage 10.5.5

1. Turn off the Model 520A. Set the rear panel AC Mains power switch to "0" and disconnect the line cord from the monitor.
2. Place a screwdriver into the Fuse Access Slot and pry open the Fuse Access Door.

3. Using needle-nosed pliers, pull the Voltage Selector Drum from the PEM. Note the orientation of the drum; the proper voltage should face out.

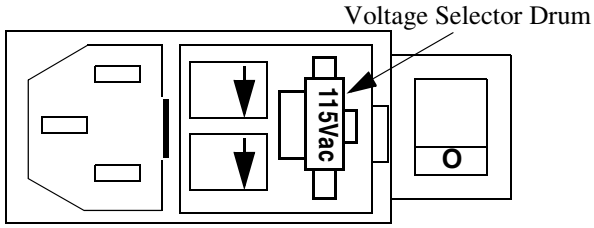


Figure 6. Power Entry Module Voltage Selector Drum Removal

4. Set the Voltage Selector Drum so that the printed side of the correct voltage faces you. The voltage selections are pictured below.

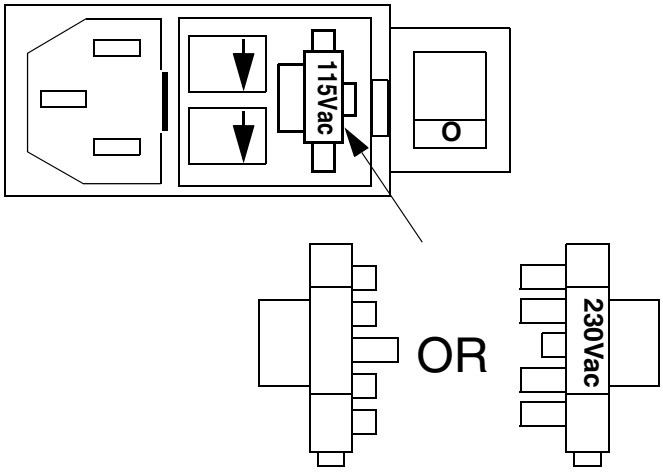


Figure 7. Power Entry Module Voltage Selection Adjustment

5. Snap the Voltage Selector Drum back into the PEM. Be sure that the Voltage Setting Indicator shows the proper voltage. Close the Fuse Access Door.

Assembly Exchanges 10.6

Disassembly should be performed by qualified personnel. Follow proper grounding procedures to avoid damage to internal components from static discharge.

1. Turn the Model 520A Off. Disconnect the line cord and sensor. Remove the four cover screws from the bottom cover. Holding both case halves together, flip the monitor right-side up.

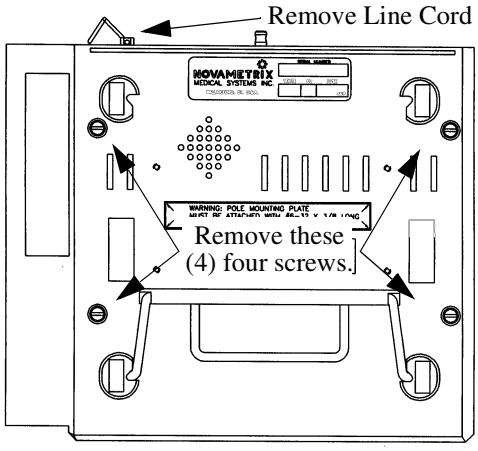


Figure 8. Removing the Top Cover

2. Lift the top cover from the monitor. Use a gentle rocking motion to lift first one side and then the other side a little at a time. Set the Red Alert Bar lens aside with the cover for safe keeping.

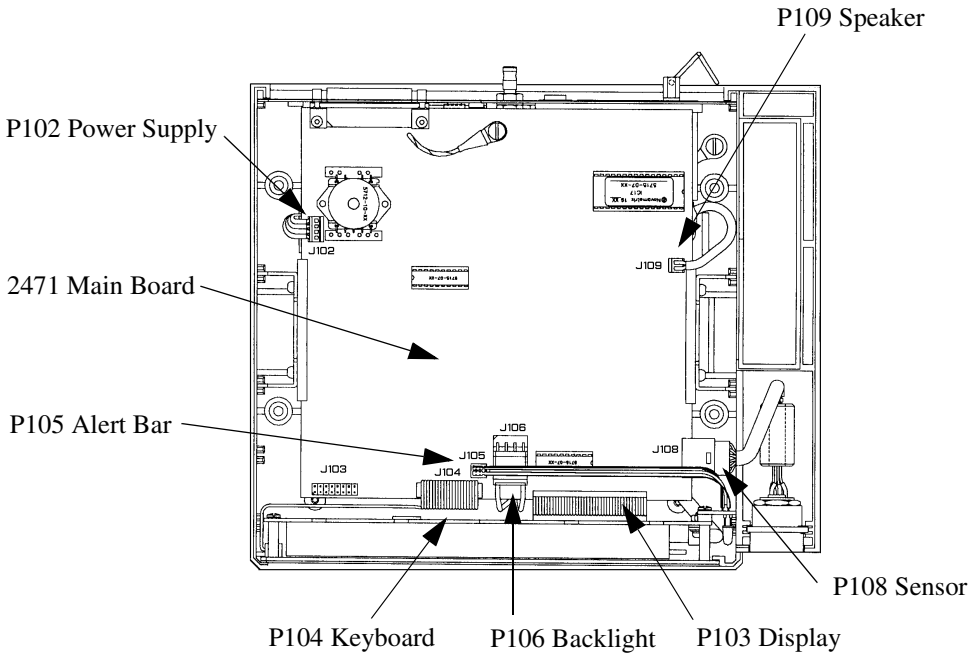


Figure 9. Monitor Assembly

3. Unplug P102 The Power Supply connector from the 2471 Main Board, disconnect P109 (Speaker), P108 (Sensor), P104 (Keypanel), P106 (Backlight), P105 (Alert Bar), and P103 (Display). Unscrew 2471 Main

Board from the rear panel. Remove the front Bezel assembly then slide the 2471 Main Board out, the 2472 Power Supply Board and Battery should be exposed.

4. The separate sections of the monitor can now be removed.

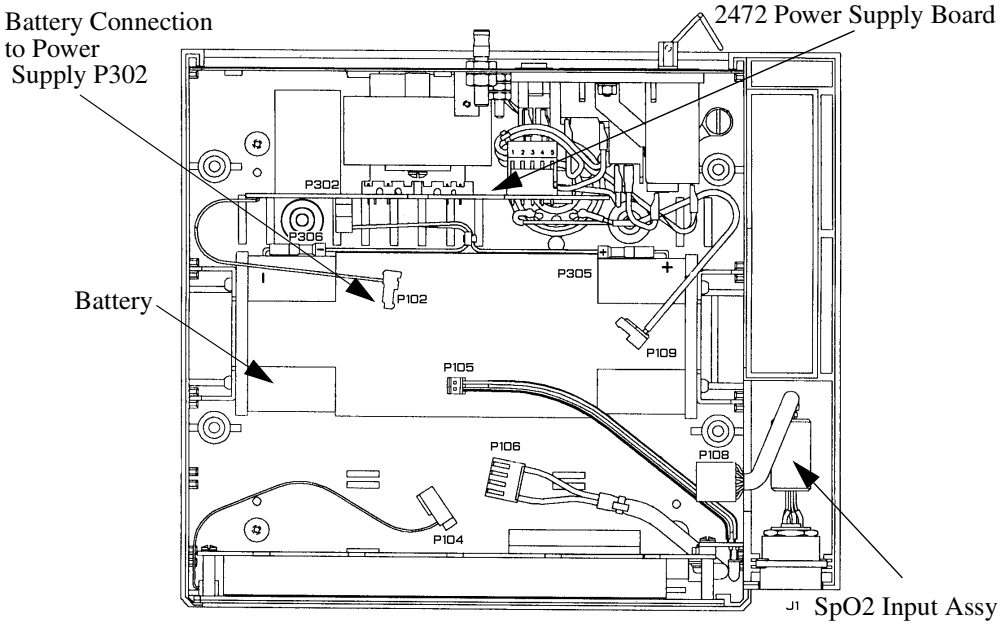


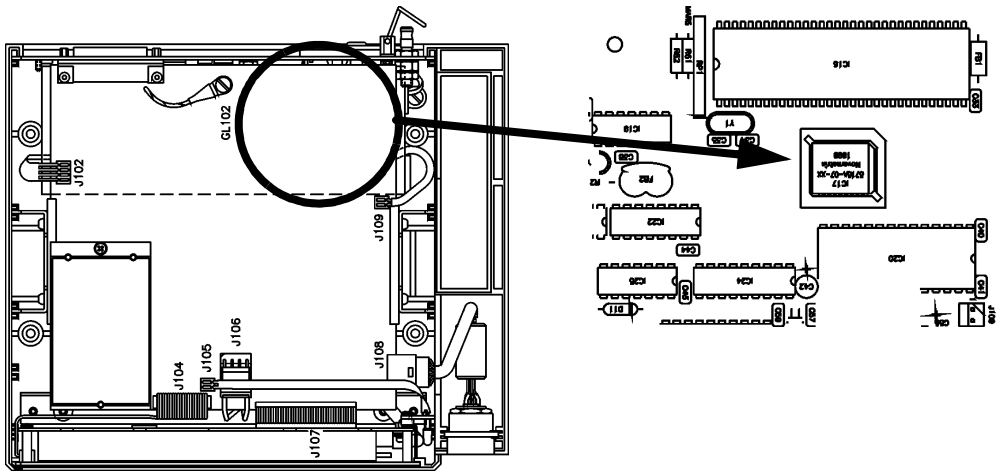
Figure 10. 520A Assembly with 2471 Main Board Removed

5. IMPORTANT. The battery is connected to the Power Supply Board through connector J302. Before attempting to apply power to the monitor ensure all connections are properly made, then connect the AC mains and turn the PEM switch to "|", ensure that the ∼ on the front panel illuminates before powering up.
6. Remove/replace the various assemblies as needed. IMPORTANT: The monitor *will be damaged* if power is applied to it while cables or assemblies are improperly connected.
7. After the monitor is fully assembled perform safety checks. Reconnect the line cord to the AC Mains and to the monitor. Set the AC Mains switch to the "|" (On) position. Verify the ∼ indicator illuminates. Turn the monitor on.
8. Measure the AC leakage current from the monitor's chassis to earth ground with the monitor grounded, ungrounded, and ungrounded reverse polarity. When operating from 100/120 VAC, no leakage current may be greater than 25 µA. If operating at 220/240 VAC, no leakage current may be greater than 50 µA.
9. With the monitor grounded, measure from the AC line to the SaO_2 Input connector pins. When operating from 100/120 VAC, no leakage current may be greater than 25 µA. If operating at 220/240 VAC, no leakage current may be greater than 50 µA.

Changing System Software 10.7

The system software is contained in EPROM IC17 on the 2775 Main Board. New software releases are made available from time-to-time. These new releases may add features or be maintenance upgrades. To install a new EPROM:

1. Follow the steps listed in *Assembly Exchanges* on page 41 to open the monitor. Be sure to disconnect J102 from the 2775 Main Board to ensure that there is no power on the board while changing the system software.
2. Use a PLCC extraction tool to carefully pry the EPROM IC17 from the socket.



3. Install the update EPROM into the socket. Align the EPROM so that IC17 pin-1 is inserted into pin 1 of the socket.

Changing System Software on 2471 Main Board 10.7.1

The system software is contained in EPROM IC17 on the 2471 Main Board. New software releases are made available from time-to-time. These new releases may add features or be maintenance upgrades. To install a new EPROM:

1. Follow the steps listed in *Assembly Exchanges* on page 41 to open the monitor. Be sure to disconnect J102 from the 2471 Main Board to ensure that there is no power on the board while changing the system software.

2. Use a small flat-blade screwdriver (or IC extraction tool) to pry the EPROM IC17 from the socket—be careful not to bend the pins.

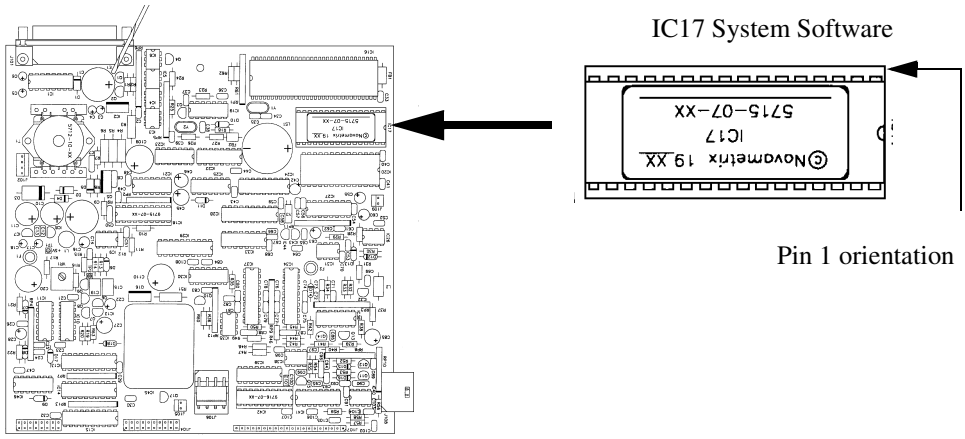


Figure 11. Changing the System Software EPROM

3. Install the new EPROM into the socket. Align the EPROM so that IC17 pin-1 is inserted into pin 1 of the socket.
4. Reverse the above steps to reinstall the assembly into the monitor.

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11 Troubleshooting

Fault, alert and error messages that can appear on the Model 520A Message Center display are described below.

Paragraphs marked with a "☞" are intended for qualified service personnel only.

Message Center Display	Possible Explanation
AUDIO OFF DISABLED	Displayed if user tries to enable Audio Off mode (by pressing and holding the **AUDIO** key) while the "Allow Audio Off" portion of the Options Menu is set to "No".
BAD SIGNAL TIMEOUT	Monitor not receiving valid signals from sensor. May be caused by excessive motion, cardiac arrhythmia or other situations leading to poor signal. Check patient status, reposition sensor.
BATTERY EXHAUSTED CONNECT LINE CORD	Monitor is running on battery power and the battery power has been depleted. Connect line cord to AC Mains power source and set the rear panel switch to "I". ☞ Monitor's rear panel fuse has blown, monitor switched over to battery power and has depleted battery life.
CAN'T I.D. PROBE	Sensor is placed on too thick of a site. Reposition the sensor on a thinner (less opaque) section of tissue. A non-SuperBright™ sensor is connected, use only 87xx series sensors. Sensor is faulty. Remove sensor from use and contact qualified service personnel.
CONNECT SP02 PROBE	Sensor is disconnected from the monitor. Sensor is faulty. Remove sensor from use and contact qualified service personnel. ☞ Both sensor LEDs have failed or the cable connections are open or shorted.
PROBE FAULTY	Sensor faulty. Remove sensor from use and contact qualified service personnel. ☞ This error traps intermittant faults such as Probe Red LED or Infrared LED failures caused by frayed or broken wires in the sensor cable. Whereas PROBE RED or I.R LED FAILED is displayed for as long as the error lasts, Faulty Probe is displayed if those errors cease without the user replacing the faulty sensor.
EVENT MARKED	An event was successfully entered into trend memory.

Message Center Display	Possible Explanation
INCOMPATIBLE PROBE	A non-SuperBright™ sensor is connected, use only 87xx series sensors. Sensor is faulty. Remove sensor from use and contact qualified service personnel.
INSUF. LIGHT **	Insufficient Light, where ** is time in seconds (after 99 seconds display shows "--"). Sensor placed on a site too thick (or opaque) for adequate light transmission. Reposition the sensor. A non-SuperBright™ sensor is connected, use only 87xx series sensors.
LIGHT INTERF.**	Light Interference, where ** is the time in seconds (after 99 seconds display shows "--") ambient light sources (sunlight, warming lights, etc.) are interfering with sensor light sources. Shield the sensor from ambient light sources.
LOW SIGNAL **	Low Signal Strength, where ** is the time in seconds (after 99 seconds display shows "--") that the pulse strength as detected by sensor is too weak for proper monitor operation. Reposition sensor.
MONITOR ERROR	Monitor faulty. Record error message (appearing on bottom line of display) and contact qualified service personnel. ☞ "RAM SELF TEST FAILED" - Ram failed the power up self-test. ☞ "ROM SELF TEST FAILED" - Calculated EPROM checksum not does not equal stored value. Bad EPROM. ☞ "BAD STACK POINTER" - Stack pointer base not at top of stack. ☞ "CORRUPT SYSTEM MMU" - The CPU MMU pointing to an illegal address map. Digital Bd fault. ☞ STACK OVERFLOW" - Stack pointer exceeded allocated stack size. ☞ "DISP BUFFER OVERFLOW" - Display buffer queue exceeded its allocated size. ☞ "HARDWARE ERROR 1" - (1)Main Bd PEEL is defective, (2) Main Bd 20-bit ADCs exceeded acceptable calibration thresholds. ☞ "XXms INT.TIMEOUT" where XX is 10 or 25. The interrupt has interrupted itself. ☞ "ERROR UNDEFINED" - Failed in an unknown state.
MONITOR PERFORMING SELF TEST.	Monitor is performing its power up system diagnostic tests.
Parameters Reset To Factory Default	Displayed when monitor is turned on while pressing the **ALERT RESET** key. Monitor now using factory default settings.

Message Center Display	Possible Explanation
PROBE FAULTY RD	Sensor faulty. Remove sensor from use and contact qualified service personnel. ☞ Sensor Red LED has failed or the cable connections are open or shorted.
PROBE FAULTY IR	Sensor faulty. Remove sensor from use and contact qualified service personnel. ☞ Sensor Red LED has failed or the cable connections are open or shorted.
PROBE OFF PATIENT	Sensor disconnected from patient, improperly applied, or placed on an area too translucent for proper sensor operation. Reposition sensor.
PULSE-HIGH	Selected pulse rate high alert limit has been violated.
PULSE-LOW	Selected pulse rate low alert limit has been violated.
PULSE OUT OF RANGE	Pulse rate is less than 30 bpm or is greater than 250 bpm.
Revision 2.0 **APR/28/92**	Monitor software revision level. Displayed when monitor is turned on while pressing **AUDIO** key.
SpO2-HIGH	Selected saturation high alert limit has been violated.
SpO2-LOW	Selected saturation low alert limit has been violated.

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12 Functional Test

Introduction 12.1

The test verifies overall functional integrity[1] of the monitor and sensors. If the monitor or sensors do not pass these tests, remove from use and contact the Novametrix Service Department for repair/replacement assistance.

This procedure assumes the technician performs each step as indicated - leaving the monitor in a known state prior to performing the next step. If steps are omitted or performed out of order, be sure that the monitor is set to the correct state beofre continuing.

Monitor Functional Test 12.2

12.2.1 Equipment Required:
Model 520A to be tested
AC Mains Line Cord (supplied with monitor)
Finger Sensor (Cat. No. 8776) or Y-Sensor™ (Cat. No. 8791)

12.2.2 Visually inspect the monitor and line cord. Verify there is no external damage. Shake the unit to check that there is no loose hardware inside.

12.2.3 Inspect the sensor(s). Verify mechanical integrity.

12.2.4 Check the rear panel power entry module. Verify that it is set to the proper voltage.

12.2.5 Set the AC Mains switch to the "0" (Off) position. Connect the line cord to the monitor and to the AC Mains.

12.2.6 Verify the ∿ (AC Mains) indicator is not illuminated.

12.2.7 Set the AC Mains switch to the "|" (On) position. Verify the ∿ indicator illuminates.

12.2.8 Depress and hold the **ALERT RESET** key. Press the front panel **POWER** key then release both keys. The monitor will;

- Briefly illuminate all displays and indicators[2]
- Produce an audible "beep" indicating the audio is operational

1. See Section 13, *Accuracy Test*, on page 55 for tests that check the accuracy of the monitor.
2. The AC indicator will illuminate only when the monitor is connected to line power and the rear panel Power switch is On (|).

- Briefly display Parameters Reset To Factory Default.[3]
- Briefly display MONITOR PERFORMING SELF TEST.[4]
- The message center will display ERASE STORED TRENDS ? for approximately 10 seconds.

12.2.9 Verify the Message Center flashes CONNECT SPO2 PROBE while no sensor is connected to the monitor.

12.2.10 Press the **ALRT** key to display the SET ALERT LIMITS menu.
Press the ↓ (down arrow) key several times and verify the Saturation display upper alert limit decreases each time the key is pressed.

12.2.11 Press the **RUN** key. Note the displayed Saturation alert limit settings. Turn the monitor off and back on again. After the self-test is complete, verify the monitor "remembered" the alert limit values.

12.2.12 Press the **Menu** key and then the **AUDIO** key.
Press the **ALERT** key to display the SET ALERT VOLUME menu.
Press and hold the ↓ key and verify the volume of the tone decreases as the volume display decreases to 01. Press the ↑ key to return to maximum (07) volume. Press **RUN**.

12.2.13 Press **MENU** then press **LITE**, verify the backlight toggles between dim and bright with each depression.
Press **RUN**.

12.2.14 Press the **Menu** key and then the **AUDIO** key.
Press the **PULSE** key to display the SET AUDIO FEATURES menu.
Press the ↑ key to set the value to 01 then press **RUN**.

12.2.15 Do not apply the sensor to yourself. If using a Y-Sensor, fold the sensor heads so that the windows face (or even touch) each other. Connect the sensor to the monitor. Verify the Message Center flashes PROBE OFF PATIENT and no alarm sounds.

12.2.16 If using a Finger sensor, apply it to your index finger, and if using a Y-Sensor, tape the sensor to your index finger. Verify that after several seconds, reasonable Pulse Rate and Saturation (>95%) values are displayed.

12.2.17 Check that the Message Center displays a Pulse Activity Bar and that a tone sounds with each pulse beat. (Note that the pitch of the tone will vary with the Saturation display value.)

12.2.18 Remove the sensor from your finger. Verify the Saturation and Pulse Rate displays blank out, an alarm sounds and PROBE OFF PATIENT is displayed. (If using a Y-Sensor, you may have to fold the heads so that the windows face each other in order to make the alarm and message activate.)

3. This message is only displayed if the ALERT RESET key is depressed at power up.
4. If "Monitor Error" appears, turn the monitor off and back on. If the message reappears, contact qualified service personnel. See Section 11, *Troubleshooting*, on page 47.

12.2.19 Press and release the **AUDIO** key. The (Two Minute Silence) indicator should illuminate and the alarm should be silenced. After two minutes the indicator turns off and the alarm sounds again (providing the alarm condition still exists).

12.2.20 With the alarm sounding, press and hold the **AUDIO** key until the (Audio Off) indicator illuminates. Verify that the alarm is silenced.

12.2.21 Press and release the **AUDIO** key. Verify the indicator shuts off and the alarm sounds.

12.2.22 With the PROBE OFF PATIENT alarm still sounding, press the **ALERT RESET** key. Verify the message and alert indicators continue to flash but the alarm is silenced.

12.2.23 Set the AC Mains switch to the "0" (Off) position. Verify the unit operates from battery power (provided the battery is substantially charged). Place the AC Mains switch back to the "l" position.

12.2.24 Press the **POWER** key to turn the monitor off and disconnect the sensor.

12.2.25 Depress and hold the **ALERT RESET** key. Press the front panel **POWER** key then release both keys. The monitor will power up with the factory default settings in place. After the self-test is complete, turn the monitor off.

12.2.26 This completes the Functional Test. If the monitor and sensor performed as described above, they are functionally operational. If the monitor is to be returned to clinical use, be sure to let the user know that the monitor is now using its default settings—as these may differ from the user's "normal" settings.

Special Power Up Functions 12.3

Each of the Model 520A front panel pushbutton keys is linked to a special "hidden" power up function. To initiate the special function, start with the monitor off and press a front panel key. While still holding that key, press the **POWER** key to turn the monitor on.

AUDIO = Software (EPROM) Revision Level
Turn the monitor on while holding the **AUDIO** key and the monitor's software revision level is displayed in the message center for as long as the **AUDIO** is pressed. Release the key and the monitor continues with its normal power up sequence.

ALERT RESET = Return to factory default settings
Turn the monitor on while holding the **ALERT RESET** key and the monitor resets all its control settings (including alert limits, averaging times, etc.) to the factory default values. A Parameters Reset To Factory Default message is briefly displayed and the monitor continues with its

normal power up sequence. Note that the system date and time are not affected by this action.

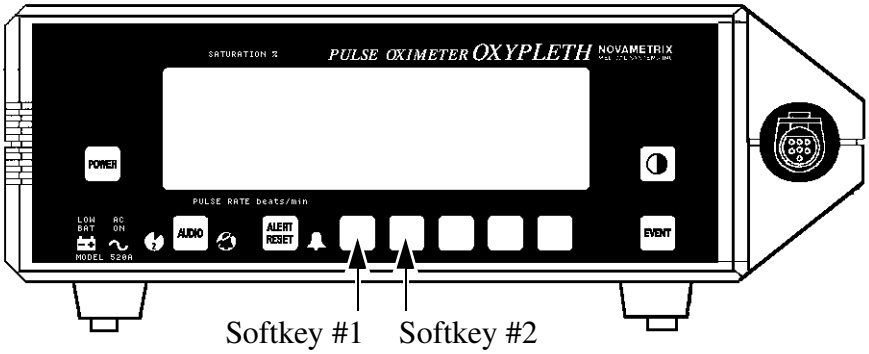

Figure 12. Softkey Identification

Softkey #1 = EPROM Checksum Test, Production Test Mode
Turn the monitor on while holding **Softkey #1** (the leftmost softkey) and the monitor calculates and displays the checksum value of the EPROM containing the system software. Press and hold **Softkey #3** while the checksum is displayed and the monitor enters Production Test Mode.

Softkey #2 =Extended Display and Watchdog Test
Turn the monitor on while holding **Softkey #2** (second from left) and all front panel indicators and display segments illuminate for several seconds. The watchdog now resets the monitor which should then execute its normal power up sequence. Note that the ∿ indicator will illuminate only if the monitor is being powered from the AC Mains.

13 Accuracy Test

Introduction 13.1

The Accuracy Test verifies the performance accuracy of the Model 520A Pulse Oximeter monitor. If the monitor does not pass the accuracy test, the monitor should be recalibrated. Refer to Section 14, *Calibration Tests*, on page 59, or contact the Novametrix Service Department for repair/replacement assistance.

The test requires the use of the Model TB500B Sensor Simulator.[1] This is the same device used by the factory technicians to calibrate the monitor prior to shipping. The TB500B is an updated version of the TB500A Test Box. Owners of TB500A should contact the Novametrix Service Department for details on upgrading to the TB500B. Note that the TB500A, used in conjunction with the Cat. No. 5453-00 Adapter Cable, may be substituted for the TB500B in most parts of this test.

Monitor Accuracy Test 13.2

13.2.1 Equipment Required:
Model 520A to be tested
AC Mains Line Cord (supplied with monitor)
TB500B Sensor Simulator (Cat. No. 5530-00)

13.2.2 Press and release the front panel **POWER** key. The monitor will;

- Briefly illuminate all displays and indicators[2]
- Produce an audible "beep" indicating the audio is operational
- Briefly display MONITOR PERFORMING SELF TEST.[3]
- Display the Message Center flashes ERASE STORED TRENDS? for ten seconds then displays CONNECT SPO2 PROBE while no sensor is connected to the monitor.

13.2.3 Press the **Menu** key and then press **AVG**.
The SELECT SPO2 AVERAGING menu should be displayed. Press **2s** and then press **RUN** to return to the Main Menu. This sets the SpO_2 averaging to 2-seconds for the quickest response to changing TB500B settings.

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1. Available through the Novametrix Service Department.
2. The AC indicator will illuminate only when the monitor is connected to line power and the rear panel Power switch is On (|).
3. If "Monitor Error" appears, turn the monitor off and back on. If the message reappears, contact qualified service personnel. Refer to Section 11, *Troubleshooting*, on page 47.

13.2.4 Set the TB500B to these settings;
Power - On, Sensor Type[4] - 87xx, Signal Attenuation - 3, Saturation - 92.

13.2.5 Connect the TB500B to the Model 520A SpO_2 Input Connector.
Verify a Pulse Activity Bar appears in the Message Center.
Verify SpO_2 and Pulse Rate values appear after several "pulses".

13.2.6 Set the Signal Attenuation to 1. Verify the Saturation and Pulse Rate displays blank out, an alarm sounds and PROBE OFF PATIENT is displayed. Set the Signal Attenuation to 3 and verify the displays and Pulse Activity Bar return.

13.2.7 Set the Saturation to 0. Verify that after a short delay, LOW SIGNAL appears in the Message Center. Set the Saturation to 100 and verify the displays and Pulse Activity Bar return.

13.2.8 Press and hold the TB500B RED push-button. Verify the monitor alarms and displays PROBE FAULTY RD. Release the button.

13.2.9 Press and hold the TB500B INFRARED push-button. Verify the monitor alarms and displays PROBE FAULTY IR. Release the button. Verify the displays and Pulse Activity Bar return.

13.2.10 Press and hold both the TB500B RED and INFRARED push-buttons. Verify the displays blank out and CONNECT SPO2 PROBE is displayed. Release the buttons. Verify the displays and Pulse Activity Bar return.

13.2.11 Disconnect the TB500B from the monitor. Set the Sensor Type switch to 86xx.[5] Reconnect the simulator to the monitor. Verify the message INSUFFICIENT LIGHT is replaced in approximately 10 seconds by CAN'T I.D. PROBE, which is itself replaced later by PROBE FAULTY. Disconnect the TB500B from the monitor, return the Sensor Type switch to 87xx and then plug it back in. Verify the displays and Pulse Activity Bar return.

13.2.12 Press and hold the **AUDIO** key until the (Audio Off) indicator illuminates. This will keep the monitor silent for the remainder of the test.

13.2.13 Verify the displayed SpO_2 value is within the tolerances stated below for each setting of the Signal Attenuation and Saturation switches. Verify a Pulse Rate of 60 bpm ± 1bpm for all switch settings. (Note that alert

4. The 5453-00 Adapter Cable is used instead of the Sensor Type switch for the TB500A.
5. If using a TB500A, disconnect the Adapter Cable and plug the TB500A directly into the Model 520A. The Message Center should display "INCOMPATIBLE PROBE". Install the Adapter Cable between the TB500A and the Model 520A and move on to the next step.

messages will be generated and displayed as the saturation value violates the alert limit settings.)

TB500B		520A	520A SpO_2
SAT	ATTEN	SpO_2	(w/ TB500A)
100	3	99 ± 1	99 ± 1
92	3	92 ± 2	92 ± 2
82	3	82 ± 2	84 ± 2
72	3	72 ± 2	77 ± 2
62	3	62 ± 2	69 ± 2
100	7	99 ± 1	99 ± 1
92	7	92 ± 4	92 ± 4
82	7	82 ± 4	84 ± 4
72	7	72 ± 4	77 ± 4
62	7	N/A	N/A

Table 3. SpO2 Display tolerances for TB500B settings

13.2.14 Press the **Menu** key and then press **AVG**. Press the appropriate key to return the averaging to its pretest value.
Press **RUN** to return to the Main Menu.

13.2.15 This completes the Monitor Accuracy Test. If the monitor does not meet the above listed specifications, refer to Section 14, *Calibration Tests*, on page 59, or contact the Novametrix Service Department for recalibration, repair, or replacement information.

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14 Calibration Tests

Introduction 14.1

The Calibration Tests verify the calibration and operation of the electronic circuits within the Model 520A Pulse Oximeter. These tests do NOT need to be performed on a regular (preventative maintenance) basis. Perform these tests only if the monitor fails to operate as expected and/or fails the *Functional Test* on page 51 and/or the *Accuracy Test* on page 55. Calibration Tests should be performed only by qualified service personnel. The Model 520A contains static sensitive devices. Follow proper grounding procedures when handling the internal components to avoid damage from static discharge.

The test requires the use of the Model TB500B[1] Sensor Simulator Test Box. This is the same device used by the factory technicians to calibrate the monitor prior to shipping. The TB500B is an updated version of the TB500A[2] Test Box.

If the monitor does not pass the Calibration Tests, remove it from use and contact the Novametrix Service Department for repair/replacement assistance.

This procedure assumes the technician performs each step as indicated—leaving the monitor in a known state prior to performing the next step. If steps are omitted or performed out of order, be sure that the monitor is set to the correct state before continuing.

Equipment Required and Test Setup 14.2

14.2.1 Model 520A to be tested
AC Mains Line Cord (supplied with monitor)
TB500B Sensor Simulator (Cat. No. 5530-00)
or TB500A Sensor Simulator and Adapter Cable 5453-00.
RS232 test fixture, PN: 5479-01
Saturation test jack, PN: 5942-00
Digital Voltmeter
Small Flat-blade screwdriver

14.2.2 With the Model 520A Off. Disconnect any line cord and sensor from the monitor.

1. Available through the Novametrix Service Department.
2. The TB500A, used in conjunction with the Cat. No. 5453-00 Adapter Cable, may be substituted for the TB500B in most parts of this test.

14.2.3 Flip the monitor over to expose the bottom cover and remove the four cover screws. Holding both the top and bottom halves together, flip the monitor over again and set it on its bottom cover.

14.2.4 Lift the top cover from the monitor and set it aside. Set the Red Alert Bar lens aside with the cover for safe keeping.

Test Procedure 14.3

Unless otherwise specified all measurements are with respect to isolated ground. Use the top of R4 (end closest to IC2) as ground reference.

14.3.1 Attach a line cord and place the mains switch to the "|" position. Verify that the green ∿ LED on the front panel illuminates. The monitor may power up when the Mains switch is set to"|", if this occurs turn the monitor off with the front panel button.

14.3.2 Measure the voltage at J102 pin 2 and verify 13.2 VDC ± 0.4 volts. This voltage is dependent on a fully charged battery installed. If an installed battery is less than fully charged, the measured voltage will not match the expected voltage.

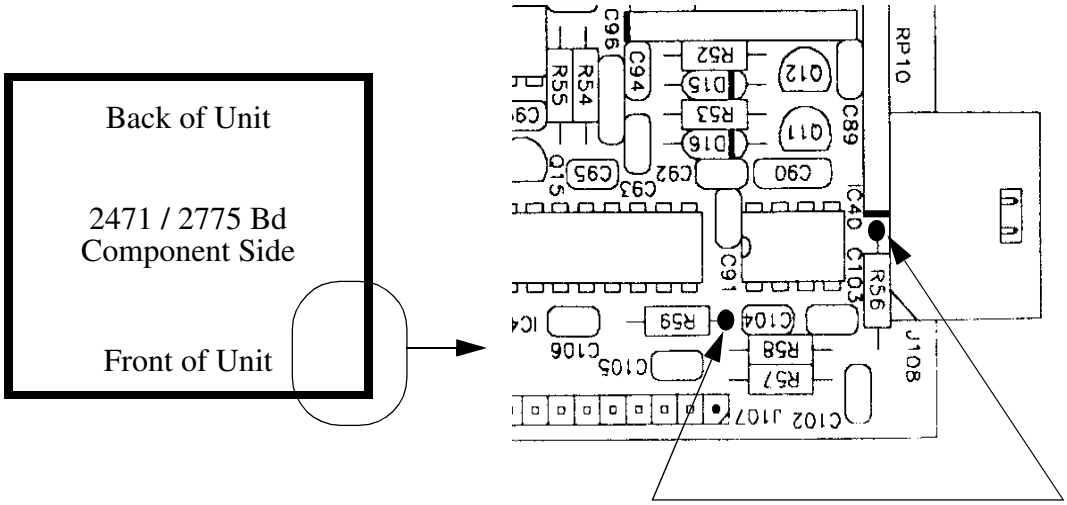
14.3.3 Simultaneously press the leftmost softkey and the power button. While `Calculating Checksum` is displayed, press and hold the third softkey from the right until `Novametrix Inc Production Test` appears.

14.3.4 Measure the voltage at TP1. Verify 5.000V ± 50mV. Adjust VR1 if necessary.

14.3.5 Verify the following voltages:

Location	Signal Name	Voltage
IC40 pin 4	-VA	-12.00V ± 500mV
IC40 pin 8	+VA	12.00V ± 500mV
IC20 pin 28	VBACK	4.75V ± 250mV
IC37 pin 14	+V5	5.00V ± 250mV
IC37 pin 7	-V5	-5.00V ± 250mV
IC37 pin 10	VREF	2.500V ± 5mV
IC36 pin 1	4VREF	4.045V ± 50mV
IC30 pin 14	-4VREF	-4.045V ± 100mV

14.3.6 Short out capacitor C90 by installing a jumper wire from R59 to R56.



14.3.7 Connect the RS232 test fixture to J101 and the saturation test jack to the saturation input connector.

14.3.8 Run monitor test 1. Press the Test softkey, `Automatic Test` will appear. Press the Test softkey again to initiate the test, follow the prompts in each test and verify each test passes.

*Note: A series of auto tests will be performed, if any failures are encountered the monitor will default to MONITOR TEST 2. Of the list below only the tests with * next to them are performed in the auto test. Upon completion of the auto test the monitor will default to MONITOR TEST 2. The following is a list of the monitor tests available;*

Test#	*Description*
1	*Auto Test*
*2**	*RAM Test*
*3**	*ROM Test*
*4**	*Real Time Clock Test*
*5**	*Audio Volume Test*
*6**	*Audio Frequency Test*
*7**	*RS232 Loopback Test*
8	*Keyboard Test*
9	*Mains Test*
*10**	*20 Bit ADC Test*
*11**	*8 Bit ADC Test*
12	*Display ADC Channels Test*
13	*515A-> PC Interface Test*

14.3.9 Disconnect the jumper wire, the RS232 test fixture, and the saturation test jack.

14.3.10 Connect the TB500B to the saturation input connector. Set the saturation to 0 and the attenuation to 5.

14.3.11 Using the Next softkey increment to monitor test 12 (Display ADC channels). Press the Test softkey, Display ADC channels will appear. Press the Test softkey to initiate the test. Press the Prev softkey. Verify the LED pwr=20. Press the Prev softkey until IR Adc=xxxxx appears, verify the value displayed is within the limits specified below. Press the Prev softkey again, RED Adc=xxxxx will appear. Verify the value displayed is within the limits specified. Press the exit softkey and set the TB500B saturation to 100 and attenuation to 3.

RED ADC	5B32-88CB hex
IR ADC	3324-4CB7 hex

14.3.12 Power the monitor down.

14.3.13 Power up the monitor by pressing the power button. Verify a Monitor performing self test message is displayed then is immediately followed by the main monitoring screen.

14.3.14 Press the Menu softkey followed by the Avg and 2s softkey then press Run.

14.3.15 Set the TB500B to the settings in the chart. Verify the saturation values are within the specified tolerance:

TB500B Settings		Board Parameters	
Saturation	Attenuation	Saturation	Pulse Rate
100	3	98 - 100	60 ± 1
82	3	80 - 84	60 ± 1
62	3	60 - 64	60 ± 1
72	7	68 - 76	60 ± 1
92	7	88 - 96	60 ± 1

Note: Verify a visual (alert bar flashing) and audible alert condition occurs when the saturation is set to 82. Press and hold the audio alert key. Verify the audio off LED turns on and the audible alert is silenced.

14.3.16 Change the TB500B power switch to OFF. Verify an Insufficient Light error message is displayed.

14.3.17 Change the TB500B power switch to ON. Verify the error message clears and a saturation and pulse value are displayed.

14.3.18 Set the TB500B Signal Attenuation to “1”. Verify a Probe Off Patient message is displayed.

14.3.19 Set the TB500B Signal Attenuation to “3”. Verify the error message clears and a saturation and pulse value are displayed.

14.3.20 Set the TB500B Saturation to “0”. Verify a Low Signal Strength message is displayed.

14.3.21 Set the TB500B Saturation to “100”. Verify the error message clears and a saturation and pulse value are displayed.

14.3.22 Press the TB500B Red Open button. Verify a Probe Faulty message is displayed.

14.3.23 Release the Red Open button. Verify the error message clears and a saturation and pulse value are displayed.

14.3.24 Press the TB500B Infrared Open button. Verify a Probe Faulty message is displayed.

14.3.25 Release the Infrared Open button. Verify the error message clears and a saturation and pulse value are displayed.

14.3.26 Disconnect the TB500B from the saturation input connector. Verify a Connect SPO2 Probe message is displayed.

14.3.27 Set the current time / date. Press and hold the Menu softkey. Press the Next softkey until Monitor Options 2 appears. Press the Clock softkey. Use the appropriate softkeys to set the correct Time, Mins, Day, Month and Year.

14.3.28 Set the mains switch from“I” to “O”, verify the green ∿ LED on the front panel goes out. Verify that the monitor continues to function on battery power without interruption. Power down the monitor by pressing the power button.

Safety Testing 14.4

14.4.1 Apply 1.5 KV for 60 seconds between the shorted hot and neutral leads of the power cord and chassis ground.

14.4.2 Apply 4 KV for 60 seconds between the shorted hot and neutral leads of the power cord and shorted saturation test jack.

14.4.3 Apply 1.5 KV for 60 seconds between the shorted saturation test jack and the chassis.

14.4.4 Measure the leakage from chassis gnd. to ref. gnd. with the monitor;

-grounded
-ungrounded
-polarities reversed ungrounded

With the monitor grounded measure the leakage from shorted probe to 120VAC 60Hz

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15 Connecting to other Equipment

The Model 520A Pulse Oximeter communicates with external equipment via its rear panel (25 pin D style female) connector. The monitor can be connected to RS232 compatible (digital) equipment. If the optional Analog Output Module is connected, the monitor can output to analog devices such as strip chart recorders. Refer to the Model 520A Pulse Oximeter User's Manual (Catalog No. 5693-23) for further information on the RS232 and analog outputs listed below.

Connecting the Seiko DPU-414 Thermal Printer 15.1

To connect a Seiko DPU-414 Thermal Printer (PN: 9140-00) to the *OXYPLETH*:

1. Connect the 9085-00 interface cable to the monitor's RS232 connector and to the printer's serial input connector—the 9 pin D connector.
2. Connect the AC adapter and turn the printer on.

Configuring the Seiko DPU-414 Printer 15.1.1

The Seiko DPU-414 Thermal Printer (Cat. No. 9140-00) must be configured to communicate with the *OXYPLETH*. When properly configured, the Seiko printer will retain the settings, even when turned off.

1. Slide the printer's power switch to OFF "O".
2. Press and hold the **ON LINE** button, then slide the power switch ON "I". Release the **ON LINE** button after the list of current settings starts printing out.

Setting the DIP switches: 15.1.2

1. The printout of the current settings is followed by the prompt:

   "Continue? : Push On-line SW"
   "Write? : Push Paper feed SW"

   To change the DIP switch settings, push the **ON LINE** button (to leave the DIP switch settings unchanged, push the **FEED** button).

2. "DIP SW-1" will print. Enter the new settings for switches 1-8.

   "ON" is set by pushing the **ON LINE** button once
   "OFF" is set by pushing the **FEED** button once

   The printer will confirm each selection. Repeat for DIP SW 2 and 3.

The DIP switch settings for the Model 520A are as follows:

```
[ DIP SW settings mode ]

Dip SW-1

    1 (OFF) : Input = Serial
    2 (ON ) : Printing Speed = High
    3 (ON ) : Auto Loading = ON
    4 (OFF) : Auto LF = OFF
    5 (ON ) : Setting Command = Enable
    6 (OFF) : Printing
    7 (ON ) :   Density
    8 (ON ) :   = 100 %

Dip SW-2

    1 (ON ) : Printing Columns = 40
    2 (ON ) : User Font Back-up = ON
    3 (ON ) : Character Select = Normal
    4 (ON ) : Zero = Normal
    5 (ON ) : International
    6 (ON ) :   Character
    7 (ON ) :   Set
    8 (OFF) :   = U.S.A.

Dip SW-3

    1 (ON ) : Data Length = 8 bits
    2 (ON ) : Data Parity = No
    3 (ON ) : Parity Condition = Odd
    4 (ON ) : Busy Control = H/W Busy
    5 (OFF) : Baud
    6 (ON ) :   Rate
    7 (ON ) :   Select
    8 (ON ) :   = 9600 bps

Continue ? : Push 'On-line SW'
Write ?    : Push 'Paper feed SW'
```

CAUTION: DIP SW Set Mode cannot be cancelled once it is initiated. Answer "ON" or "OFF" for every setting.

Note: More information about DIP switch settings can be found in the Seiko "DPU-414 Thermal Printer Operation Manual."

3. When the printer finishes writing the new settings to memory, "DIP SW setting complete!!" is printed out and the printer returns to ON LINE mode.

CAUTION: Never turn the printer off while it is writing the new settings to memory. Wait until "DIP SW setting complete!!" is printed, then the printer power may be turned off.

Connecting the ThinkJet Printer 15.2

To connect the Hewlett-Packard ThinkJet Printer to the Model 520A:

1. The Hewlett-Packard ThinkJet must be a Model 2225D (RS-232C interface).
2. Set the dip switches on the rear panel of the ThinkJet.
   Mode switches = 1, 2, 5, 6 up (on) and 3, 4, 7, 8 down (off).
   RS-232C switches = 1 up (on) and 2, 3, 4, 5 down (off).

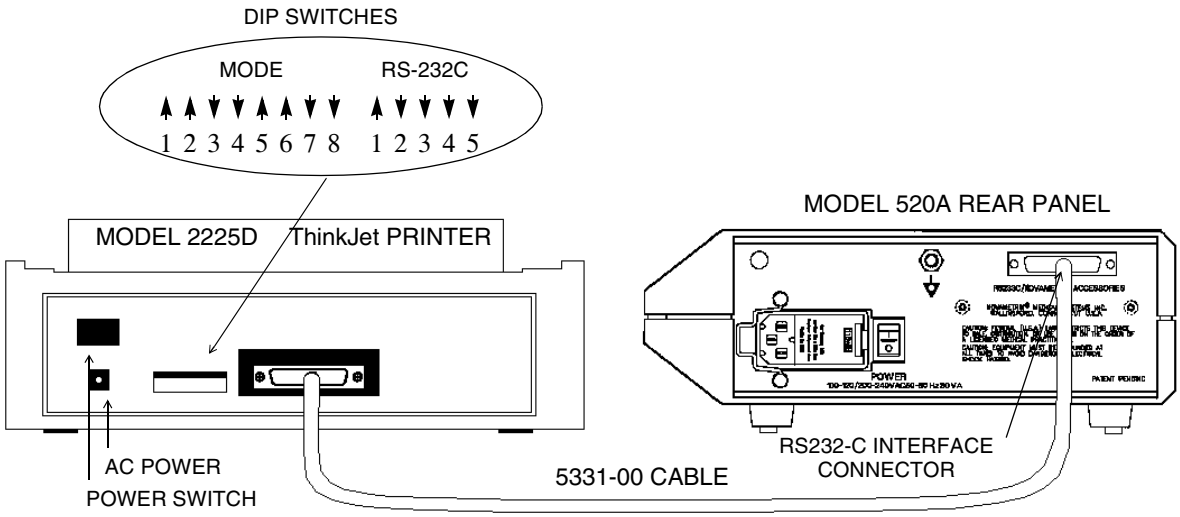


Figure 13. Connecting the ThinkJet Printer

3. Connect the interface cable, PN:5331-00, to the Model 520A RS232C connector and to the ThinkJet. (If Model 520A has an Analog Module attached, connect to the module's RS232C connector.)
4. Connect the printer's AC input and turn the printer on.
5. Select **T-Jet** (ThinkJet) from the **Ser.** (Serial) portion of the Model 520A Options Menu.
6. Refer to the ThinkJet Owner's Manual for further printer details.

Connecting the Model 315 Printer 15.3

To connect the Model 315 Printer to the Model 520A:

1. Set the dip switches on the Model 315 rear panel.
   The settings are; 1-5 up (off), 6-7 down (on), and 8 up (off).

2. Connect the printer interface cable, PN:4913-00, to the RS232C connector[1] on the Model 520A. Connect the other end of the cable to the Model 315.

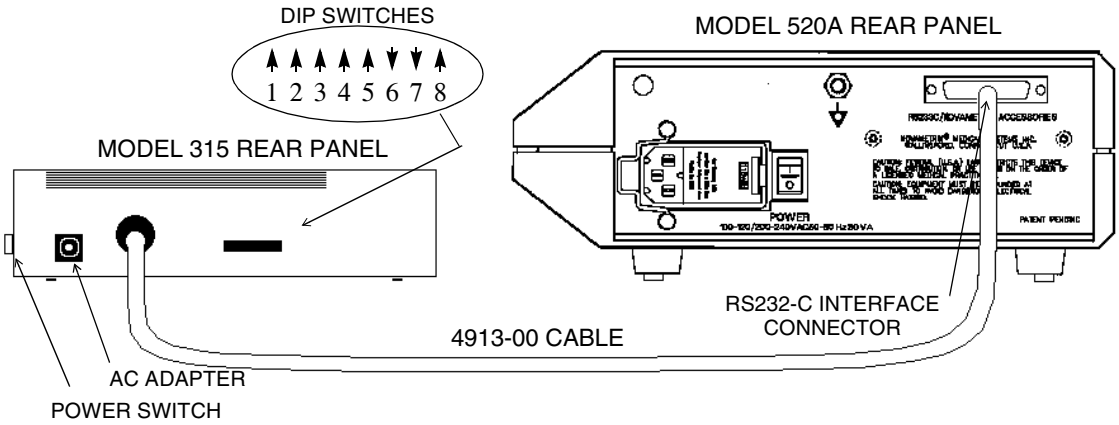


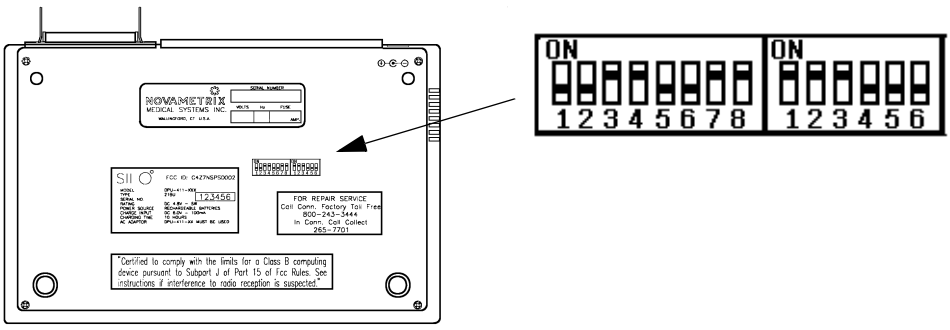
Figure 14. Connecting the Model 315 Printer

3. Connect the printer's AC adapter (if desired).
4. *Turn the printer on first*, then turn the Model 520A on.
5. Select **315** from the **Ser.** (Serial) portion of the Model 520A Options Menu.
6. Refer to the Model 315 documentation for further printer details.

Connecting Seiko DPU-411 Thermal Printer 15.4

To connect the SIEKO Model DPU-411 Thermal Printer to the Model 520A:

1. Set the DIP switches located on the bottom of the DPU-411.
   First bank of eight switches; 1,2 down (off), 3,4 up (on), 5,6 down (off), 7,8 up (on).
   Second bank of six switches; 1-3 up (on), 4-6 down (off).



Seiko DPU-411 bottom view

Figure 15. Configuration of Seiko Thermal Printer.

2. Connect the printer interface cable, PN:5861-00, to the RS232C connector on the Model 520A. Connect the 25 pin connector at the other end to the 25 pin D connector on the rear panel of the DPU-411 (upper connector).
   Plug the cable DC power plug into the rear jack of the Model DPU-411.

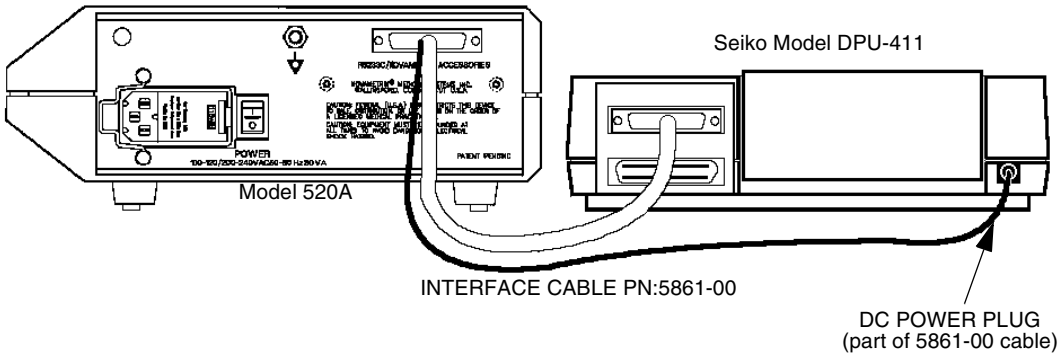


Figure 16. Connecting the Seiko Model DPU-411 Printer.

3. *Turn the printer on first*, then turn the Model 520A on.
4. Select **Seiko** from the **Ser.** (Serial) portion of the Model 520A Monitor Options 2 Menu.
5. Refer to the Seiko Model DPU-411 documentation for further printer details.

Analog Output Module 15.5

The *optional* Analog Output Module (Catalog Number 9622-01), provides the necessary analog output voltages for use with analog instruments such as strip chart recorders. (The Model 520A does not directly support analog devices.)

The Analog Output Module attaches to the connector on the rear panel of the Model 520A and provides analog output voltages, via a 9-pin connector, and RS232C pass through, via a 25-pin connector, so that both analog and serial devices can be used simultaneously.

Two screws, supplied with the module, are passed through the module and screw into the pre-tapped holes in the rear panel of the Model 520A to secure the Analog

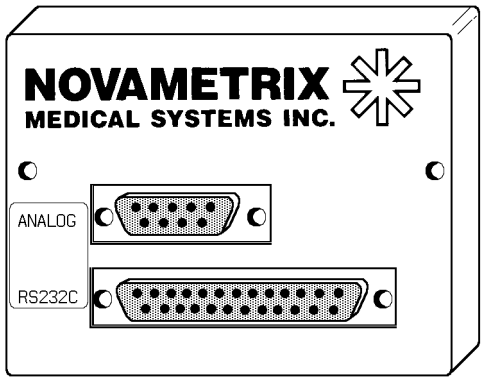
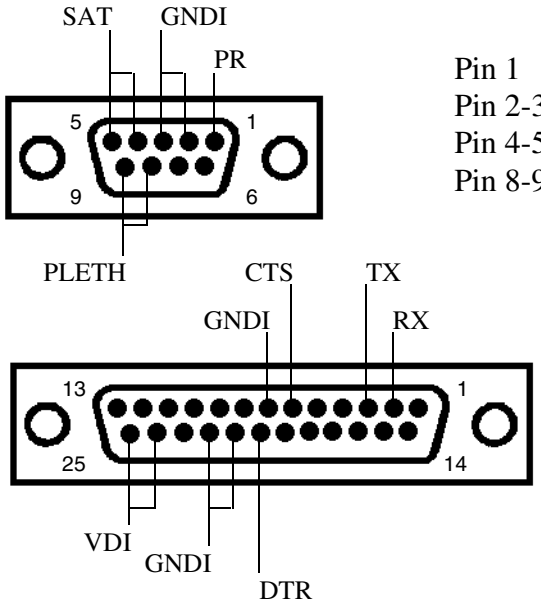


Figure 17. Analog Output Module

Output Module in place. The pinouts of the 9-pin analog and 25-pin RS232C connector are shown below.



Pin 1	Pulse Rate, 4mV/bpm, 0-1V
Pin 2-3	GNDI (Interface ground)
Pin 4-5	Saturation, 10mV/%, 0-1V
Pin 8-9	Plethysmogram, 0-1V (Auto Gain Control)

Pin 2	RX (Receive In)
Pin 3	TX (Transmit Out)
Pin 6	CTS (Clear To Send (input))
Pin 7	GNDI (Interface ground)
Pin 20	DTR (Data Transmit Ready (output))
Pin 21-22	GNDI (Interface ground)
Pin 24-25	VDI (Interface +5 volts)

Figure 18. Analog Output Module Pinouts

Analog Output Setup 15.6

A CALIBRATE RECORDER menu within the Model 520A software allows the user to easily calibrate analog recorders to the voltage levels produced by the Analog Output Module. To access this feature:

1. With the monitor in normal running mode press and hold the **MENU** key until SPO2 SETUP OPTIONS appears on the display. Press the **NEXT** key until

MONITOR OPTIONS 2 appears on the display. Select **REC** for CALIBRATE RECORDER menu.

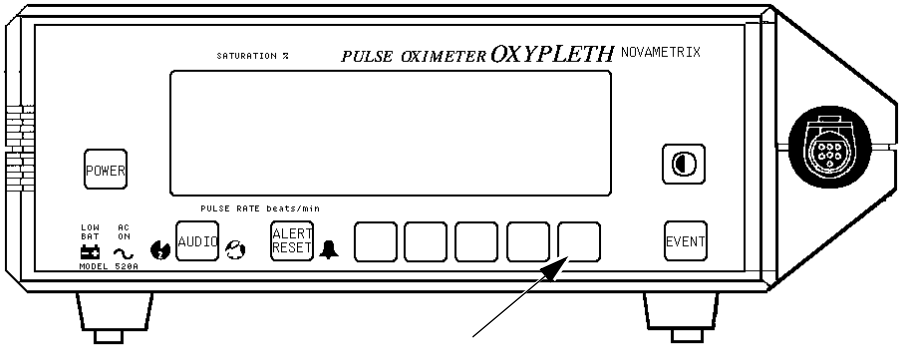
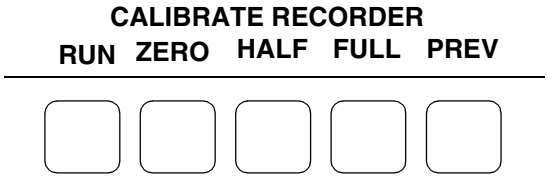


Figure 19. Analog Output Setup

2. The Recorder Outputs menu will be displayed.



- **RUN** - return to Monitoring Mode
- **ZERO** - set analog outputs to 0 volts
  (0% = 0 volts, 0 bpm = 0 volts, pleth = 0 volts)
- **HALF** - set analog output voltages to half scale
  (50% = 0.50 volts, 125 bpm = 0.50 volts, pleth = 0.50 volts)
- **FULL** - set analog output voltages to full scale
  (100% = 1.00 volt, 250 bpm =1.00 volts, pleth =1.00 volts)
- **PREV** - returns to MONITOR OPTIONS 2 menu.

3. Press the **ZERO** key and adjust the analog baselines on the recorder. Press the **FULL** key and adjust the recorder full scale deflection. Press the **HALF** key and check that the recorder registers at half scale.

Signal	Analog Connector Pin #	Min-Max Voltages (Referenced to Pins 2 + 3)		
		ZERO	HALF	FULL
Pulse Rate	1	0.000-0.012	0.477-0.520	0.955-1.030
Saturation	4 + 5	0.000-0.012	0.477-0.520	0.955-1.030
Plethysmogram	8 + 9	0.000-0.012	0.477-0.520	0.955-1.030

Table 4. Analog Output Module Voltage Tolerances

Note: Earlier versions of the Analog Output Module have a 2.5 volt maximum scale for the Plethysmogram and Pulse Rate (1.25 volt half scale).

4. When the recorder is properly adjusted, press the **RUN** key. The monitor will return to Monitoring Mode and automatically begin outputting analog data to the Analog Output Module.

   Note: This setup procedure does not have to be performed each time the monitor is turned on—the monitor will always automatically output analog information via the Analog Output Module, this procedure simply helps to calibrate the recorder to the Model 520A signals.

16 Specifications

General 16.1

Specifications for the Novametrix *OXYPLETH* Pulse Oximeter, Model 520A, are listed for informational purposes only, and are subject to change without notice.

Oxygen Saturation (SpO_2) Section 16.2

- Range, 0-100%
- Accuracy, 80-100% ± 2%, 0-79% unspecified
  (Approximately 68% of the observations are within the accuracy claim.)
- Display Resolution, 1%
- Averaging Time, menu selectable times of 2 and 8 seconds
- Audible SpO_2 Trend Feature
  Pitch of (user selectable) Pulse Rate "beep" tracks the SpO_2 value (i.e., decreasing SpO_2 values are signalled by lower pitched "beeps").
- Settling Time
  Display settles to within 1% of the final reading less than 15 seconds after the sensor is properly applied.
- Alerts
  Continuously displayed. Menu selectable high and low limits (100-50). Visible alarm is immediate. Audible alarm occurs after 10 seconds of continuous violation of the set limit, or immediately. Limit values are retained in memory when monitor is turned off, or the monitor can be set to use its default settings each time it is turned on.

Pulse Rate Section 16.3

- Range, 30-250 beats per minute (bpm)
- Accuracy, ± 1% of full scale
  (Approximately 68% of the observations are within the accuracy claim.)
- Display Resolution, 1 bpm
- Averaging Time, fixed at 8 seconds
- Settling Time
  Display settles to within 1% of the final reading less than 15 seconds after the sensor is properly applied.

- Alerts
  Continuously displayed. Menu selectable high and low limits (249-30 or Off). Visible alarm is immediate. Audible alarm occurs after 10 seconds of continuous violation of the set limit or immediately. Limit values are retained in memory when monitor is turned off, or the monitor can be set to use its default settings each time it is turned on.

General Specifications 16.4

- Operating Environment
  50-104° F (10-40 °C), 0-90% relative humidity (non-condensing)
- Weight, 7 lbs 5 oz. (3.32 kg)
- Dimensions
  Height, 3.3 inches (8.38 cm) Width, 9 inches (22.86 cm) Depth, 8 inches (20.32 cm)
- Power, 100-120/200-240 VAC, 50/60 Hz
- Fuse Rating
  U.S.A.: 0.5 A, 250 V, Slo-Blo (x2) European: T 250 mA/250 V (x2)
- Battery
  Type, lead-acid gel-cell Battery Life, 3 hours
  (Note: Excessive alerting reduces battery life.) When 15 minutes of battery life remain, the (low battery) indicator illuminates. When the battery becomes exhausted, the monitor display shuts down. Connect to AC power to recharge battery. Recharge Time, battery fully recharged in 12-15 hours max.

Additional Features 16.5

- 2 Minute Silence
  When **AUDIO** key is pressed, deactivates audible alerts for two minutes.
  Indicated by illuminated (2 Min LED).
- Audio Off
  Feature user selectable. If enabled, press and hold **AUDIO** key for 3 seconds, and audible alarms will not activate.
  Indicated by flashing (OFF LED).
- Battery Backed Trend Memory
  Trend memory print of any 30 minutes, 2 hours, 8 hours 12 hours or 24 hours when used with the Seiko DPU-414, Seiko DPU-411, Hewlett-Packard ThinkJet, or Model 315 Printer.
- Analog (Recorder) Output Module—Optional
  Provides analog output for strip chart applications at the following levels;
  Oxygen Saturation value, 10mV/% (100% = 1 V)
  Pulse Rate value, 4mV/bpm (250 bpm = 1 V)
  Plethysmograph pulse waveform, 0-1V max (AGC)

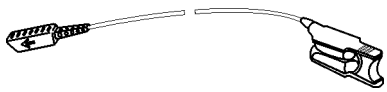
- Serial (RS232) Data Output
  Provides RS232 data interface compatible with;
  Seiko DPU-414 Thermal Printer
  Seiko DPU-411 Thermal Printer
  Hewlett-Packard ThinkJet Printer
  Novametrix Model 315 Printer
  Novametrix Model 1260 Capnograph
  Novametrix Model 1010 Telemetry Central Station
  SARACAP® monitor
  RS232 computer interface
  NOVACARD Memory Module
  NOVACOM1 Interface
- Internal Real Time Clock
- Alert Bar

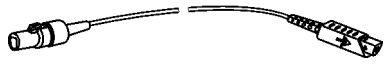
17 Accessories

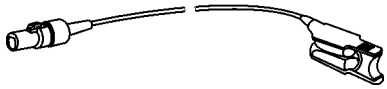
Model 520A

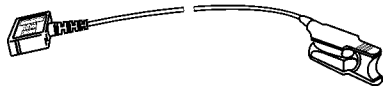
17.1

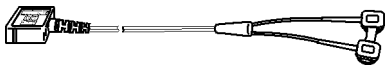
Catalog No.	Description
	SuperBright™ SpO_2 SENSORS
8793-00	***OxySnap*™ Y-Sensor™** (use with *OxySnap*™ Extension Cable), 90 day warranty
8744-00	***OxySnap*™ Finger Sensor** (use with *OxySnap*™ Extension Cable), 1 yr. warranty
8853-00	***OxySnap*™ Extension Cable** (use with *OxySnap*™ sensors), 8 feet, 1 yr. warranty
8898-00	***OxySnap*™ Extension Cable** (use with *OxySnap*™ sensors), 12 feet, 1 yr. warranty
8776-00	**SuperBright™ Finger Sensor** (10 ft sensor cable), 1 yr. warranty
8791-00	**SuperBright™ Y-Sensor™** (10 ft sensor cable), 90 day warranty
9768-00	**Finger Sensor** (use with DB-9 Sensors), 6 feet, 1 yr. warranty
9168-00	**Finger Sensor** (use with DB-9 Sensors), 3 feet, 1 yr. warranty
9769-00	**Y-Sensor™** (use with DB-9 Sensors), 6 feet, 90 day warranty
9169-00	**Y-Sensor™** (use with DB-9 Sensors), 3 feet, 90 day warranty











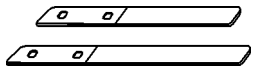
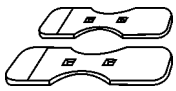
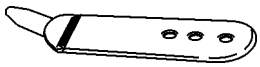
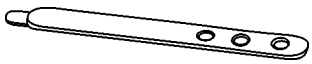
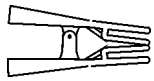
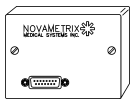
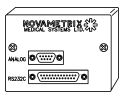
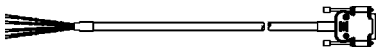
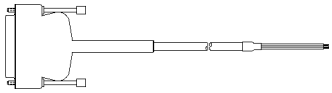
SENSOR MANAGEMENT PLANS

Select a Finger Sensor or Y-Sensor™ Management Plan for each SuperBright™ Pulse Oximeter. The plan you select determines the length of coverage—36 or 60 months.

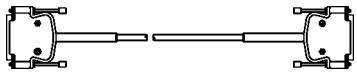
How the Plans Work: Included in each Plan are TWO sensors—one for immediate use, the other one for back-up. If a sensor becomes inoperative, place the backup sensor into use and return the inoperative sensor in the convenient prepaid mailer. A replacement sensor will be shipped within two business days of receipt of the inoperative sensor. This simple return/replacement method will be used for the entire warranty period, thereby, guaranteeing your costs and virtually eliminating sensor tracking hassles.

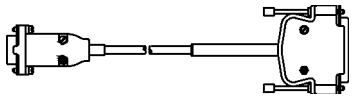
Warranty: For each Pulse Oximeter a plan is purchased for, the warranty on the monitor is also extended to the length of the Plan (a pre-contract inspection may be required). Replacement sensors provided under terms of the Plan shall carry the remaining Plan warranty—replacements do not extend the warranty.

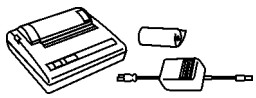
8791-36	**Y-36 Plan** The Plan length is 36 months. Includes 9 boxes of any Y-Strip Taping Systems

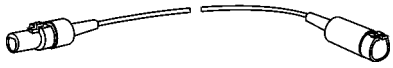
Catalog No.	Description	
8791-60	**Y-60 Plan** The Plan length is 60 months. Includes 15 boxes of any Y-Strip Taping Systems	
8776-36	**Finger-36 Plan** The Plan length is 36 months	
8776-60	**Finger-60 Plan** The Plan length is 60 months	
	Y-SENSOR™ APPLICATORS	
8828-00	**20mm Wrap Style Taping System** (100 per box) Use on neonatal foot and hand, or on pediatric toe or finger, color coded blue	
8829-00	**25mm Wrap Style Taping System** (100 per box) Use on neonatal foot and hand, color coded green	
8831-00	**20mm Finger Style Taping System** (100 per box) Use on pediatric finger or on small adult finger, color coded blue	
8832-00	**25mm Finger Style Taping System** (100 per box) Use on adult finger, color coded green	
6929-00	**Adhesive Foam Wraps**, Large (25 per box)	
6968-00	**Adhesive Foam Wraps**, Small (25 per box)	
8836-00	**Non-Adhesive Foam Wraps**, Large (25 per box)	
8943-00	**Non-Adhesive Foam Wraps**, Small (25 per box)	
6131-50	**Ear Clips** (5 per box)	
6131-25	**Ear Clips** (25 per box)	
8700-00	**Adhesive Dots** (200 per box)	
	OUTPUT OPTIONS—ANALOG, DIGITAL & PRINTER	
5963-00	**Analog Output Module**, for *Model 2001*	
9622-01	**Analog Output Module**, for OXYPLETH®, includes RS232 pass-thru	
6045-00	**Cable**, for 5963-00 Analog Output Module (open ended, 6 ft)	
5333-00	**Cable**, for 9622-00 Analog Output Module (open ended, 6 ft)	
2736-00	**Analog/RS232 Output Option Kit for Model 515B** (if ordered at time of purchase)	
6659-00	**Cable**, for 2736-00 Analog Output Option Kit (open ended, 6 ft)	

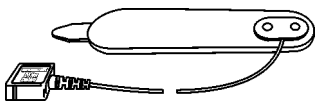
Catalog No.	Description
5334-00	**Cable**, Serial Output to Personal Computer (PC with 25-pin connector)
5335-00	**Cable**, Serial Output to Personal Computer (PC with 9-pin connector)
5726-00	**Cable**, Analog Output Module (9622-01) to Aequitron 9500 Series Monitor
9140-00	**Thermal Printer**, Seiko DPU-414 (with battery pack)
400052	**AC Adapter**, for Seiko DPU-414 Printer, 120 VAC
300017	**Printer Paper**, for Seiko DPU-411/414 Printer (2 rolls per box)
9085-00	**Printer Cable**, for Seiko DPU-414 Printer, 9-to-25 pin (Models 515B/520A/860/1265/7100/2001)
	PULSE OXIMETRY ACCESSORIES
420034	**Model 515B/C Inservice Video,** VHS video tape (NTSC format)
420016	***OXYPLETH*® Model 520A Inservice Video,** VHS video tape (NTSC format)
7106-10	**Transport Pouch**, for Models 515/520A/860/1265/7100/2001
7104-10	**Side Accessory Pouch**, (included with monitor)
600026	**Power Cord**, (included with monitor)
4941-00	**Saturation Sensor Extension Cable** (4 feet)
4942-00	**Saturation Sensor Extension Cable** (6 feet)
4943-00	**Saturation Sensor Extension Cable** (10 feet)
5266-00	**Saturation Sensor Extension Cable** (25 feet)
6147-00	**Saturation Sensor Extension Cable** (50 feet)
6455-00	**Single Patient Use Pediatric/Adult Sensor** (10 per box)
6455-25	**Single Patient Use Pediatric/Adult Sensor** (25 per box)
6480-00	**Single Patient Use Neonatal/Pediatric Sensor** (10 per box)
6480-25	**Single Patient Use Neonatal/Pediatric Sensor** (25 per box)
8933-00	**Sensor Extension Cable**, for use with Single Patient Use Sensors (DB-9 connectors)
8936-00	**Sensor Jumper Cable**, for use with Single Patient Use Sensors (DB9 to *OxySnap*™ connector)
	EXTENDED WARRANTY
	Normal warranty: Monitor—1 year
9400-81	**Model 2001 warranty extended an additional 1 year(s) at time of purchase**
5693-81	***OXYPLETH*® warranty extended an additional 1 year(s) at time of purchase**
6500-81	**Model 515B warranty extended an additional 1 year(s) at time of purchase**
6550-81	**Model 515C warranty extended an additional 1 year(s) at time of purchase**
	BIOMEDICAL EQUIPMENT & TRAINING

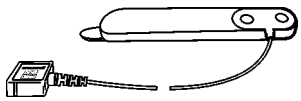


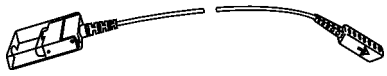












Catalog No.	Description
	Service Test Kits include items and materials qualified service personnel may require to determine the functional integrity and/or accuracy of the system.
5777-00	**Test Kit**, Pulse Oximeter
9999-96	**"focus" Technical Training Seminar** (1 day course) For class schedules call: 1-800-243-3444 Ext. 2565
MOUNTING SYSTEMS	
	ROLLSTAND
140098	**Rollstand**, includes base, casters, tilt swivel head, post, poll, handle, utility basket. Requires either 140095 or 140101 Mounting Plate Kit.
	ROLLSTAND AND MOUNTING ACCESSORIES
140095	**Adapter Plate Kit**, for 515B/C, 520A, 2001, 1265/7100, 860, and *CO_2SMO Plus!*®*
140099	**Laptop Tray with Adapter Plate**
140030	**Wall Mount**
140031	**Wall Mount** (less Wall Channel)
140032	**Pivot Block Mount**
140036	**Countertop Mount** (5 inch Base)
140100	**Swivel C-Clamp Hanger**
140067	**Clamping Block**
140068	**Counterweight**, for Rollstand
140070	**Pole Mount Bracket**, (for 2" pole), for Models 515B/C, 520A, 2001, 1265/7100, 860, and *CO_2SMO Plus!*®*
140093	**Mounting Plate Upgrade Kit**, contains Mounting Plate Only
140094	**Pole Mount**, (for 3/4" - 2" dia. pole), for Models 515B/C, 520A, 2001, 1265/7100, 860, and *CO_2SMO Plus!*®*
140097	**6" Utility Basket**, for Rollstand

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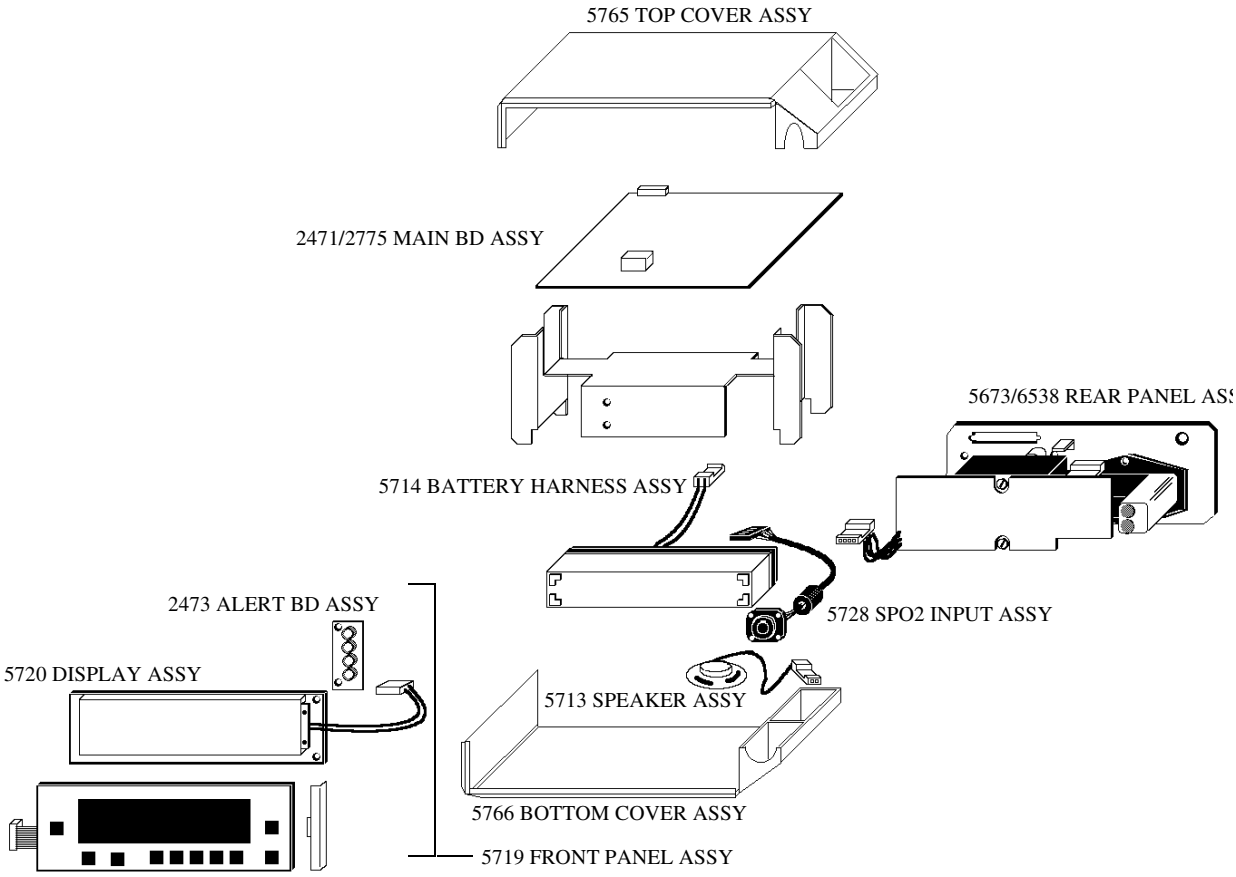
18 Parts Lists

Family Tree 18.1

The Model 520A diagram below shows the individual assemblies of the finished product— the 5693-00 Final Assembly.



5693-01 MAIN ASSEMBLY 18.2

Seq	Item Nbr	Description	Qty
013	140002	CARD GUIDE, 2.5" L	2
005	5713-01	SPEAKER ASSY	1
007	5719-01	FRONT PANEL ASSY	1
014	161067	TAPE, CL CELL	0

Seq	Item Nbr	Description	Qty
010	5766-01	BOTTOM COVER *ASSY*	1
008	5728-01	CABLE ASSY, SPO2 IN	1
001	2471-01	MAIN BOARD ASSY,	1
012	9621-16	LENS, ALERT	1
017	286220	SCREW, 6-32 X 3/16	0
003	6538-01	REAR PANEL ASSY	1
002	5664-10	CHASSIS, MODEL 520A	1
016	286205	6-32 x 3/4 S.B.H.	0
006	5714-01	BATTERY HARNESS ASSY	1
015	284200	#4-40 x 1/4 SLOTTED	0
018	400024	BATTERY, 12VDC, 2.3A	1
009	5765-01	TOP COVER ASSY	1
001	2775-01	MAIN BOARD ASSY	1

6538-01 REAR PANEL ASSY 18.3

Seq	Item Nbr	Description	Qty
007	6538-17	REAR PANEL SUBASSY	1
018	285001	LOCK WASHER, NO. 6	0
019	285005	FLAT WASHER, NO. 8	0
003	5812-10	SPACER, SUPPORT	2
002	4109-10	SUPPORT BRACKET, PC	1
024	161092	ADHESIVE, 262	0
006	9090-01	POWER CABLE ASSY	1
001	2726-01	POWER SUPPLY BD ASSY	1
014	280188	STANDOFF, 3/8 DIA	0
004	5820-01	GROUND WIRE ASSY	1
012	210149	POWER ENTRY MODULE,	1
023	285013	NYL WASH, #4 NATURAL	0
017	285000	LOCK WASHER, NO. 4	0
022	608033	WIRE CLIP & BUSHING	1
013	216059	CONNECTOR, PLUG	1
011	161008	ADHESIVE, 242	0
021	515023	FUSE, 1/2A, 250V	2
020	286219	SCREW, 6-32 X 1 1/4	0
008	6549-01	GROUND WIRE ASSY	1
016	281501	NUT, HEX, NO. 6-32	0
015	281500	NUT, HEX, NO. 4-40	0

5673-01 REAR PANEL ASSY 18.4

Seq	Item Nbr	Description	Qty
016	285001	LOCK WASHER, NO. 6	0
007	5812-10	SPACER, SUPPORT	2
002	4109-10	SUPPORT BRACKET	1
019	5819-01	GROUND WIRE ASSY	1
022	285046	WASHER, FLAT, NO. 6	0

Seq	Item Nbr	Description	Qty
005	5673-32	REAR FACEPLATE	1
006	5743-10	POWER ENTRY MODULE	1
013	280188	STANDOFF, 3/8 DIA	0
020	5820-01	GROUND WIRE ASSY	1
003	5229-11	WIRE CLIP MOD	1
017	285013	NYL WASH, #4 NATURAL	0
015	285000	LOCK WASHER, NO. 4	0
011	216059	CONNECTOR, PLUG	1
023	161008	ADHESIVE, 242	0
008	9308-11	BUSHING MOD, LINECORD	2
021	515023	FUSE, 1/2A, 250V	2
018	286219	SCREW, 6-32 X 1 1/4	0
004	5673-10	REAR PANEL	1
012	281501	NUT, HEX, NO. 6-32	0
001	2472-01	POWER SUPPLY BOARD	1
014	281500	NUT, HEX, NO. 4-40	0

2726-01 POWER SUPPLY BD ASSY 18.5

Seq	Item Nbr	Description	Qty
000	211505	CONNECTOR, 5 PIN	1
000	474145	RESISTOR, 215 OHM	
000	481530	DIODE, KBU4G, 4 AMP	
000	474214	RESISTOR, 332K OHM	1
000	474137	RESISTOR, 1M OHM	1
000	481549	DIODE, MBRS14OT3	1
000	152096	CAPACITOR, 220UF	1
000	484529	VOLTAGE REGULATOR	1
000	180014	INDUCTOR, 2SUH	1
000	474165	RESISTOR, 10K OHM	1
000	152081	CAPACITOR, 6BOOUF	1
000	474162	RESISTOR, 61.9K OHM	1
000	5918-10	XFMR, MAINS, PWR SPL	1
000	470026	RESISTOR, 150 OHM	1
000	474215	RESISTOR, 2.21K OHM	1
000	486805	IC, LM393M, DUAL VOL	1
000	2725-02	RAE, POWER SUPPLY BD	1
000	515085	FUSE W FUSEHOLDER	1
000	474141	RESISTOR, 249K OHM	1
000	2726-04	TEST PROCEDURE, PWR	0
000	600034	RIBBON CABLE ASSY	1
000	474181	RESISTOR, 4.3 OHM	1
000	474166	RESISTOR, lOOK OHM	4
000	474216	RESISTOR, 4.99K OHM	1
000	485543	TRANSISTOR, MOSFET	1
000	211213	CONNECTOR, 2 PIN	1
000	481552	DIODE, MBRS34OT3	3
000	154072	CAPACITOR, .1UF	4

Seq	Item Nbr	Description	Qty
000	474151	RESISTOR, 37.4K OHM	1
000	484559	VOLT RGLR, LT1O76CT	1
000	515083	FUSE W FUSEHOLDER	1
000	2726-17	POWER SUPPLY BOARD	1
000	154079	CAP, 1OUF, 2EV, 20%,	1
000	474218	RESISTOR, 47.5K OHM	1
000	280114	SNAP RIVET, .118	0
000	152029	CAPACITOR, 220UF 20%	1
000	485532	TRANSISTOR, 2N7002T1	1
000	474211	RESISTOR, 49.9K OHM	1
000	481561	DIODE, ULTRAFAST, 3A	1
000	474341	RESISTOR, 4.3 OHM	1
000	481563	DIODE, SCHOTTKY, 5A	2

2472- 01 POWER SUPPLY BOARD 18.6

Seq	Item Nbr	Description	Qty
024	472065	RESISTOR, 200K OHM	1
016	211505	CONNECTOR, 5 PIN	1
036	484539	VOLTAGE REGULATOR	1
001	2472-02	FAB, POWER SUPPLY BD	1
032	481530	DIODE, KBU4G, 4 AMP	1
040	515046	FUSE, 2A, 250V	1
020	472022	RESISTOR, 4.99K OHM	1
044	161049	ADHESIVE, HOT MELT	0
028	472185	RESISTOR, 61.9K OHM	1
035	484529	VOLTAGE REGULATOR	1
014	180014	INDUCTOR, 25UH, .25	1
027	472140	RESISTOR, 332K OHM	1
012	152081	CAPACITOR, 6800UF	1
037	485517	TRANSISTOR, VN1OKM	1
041	515035	FUSE, 1/2A, 250V	1
034	481542	DIODE, UF5400	2
033	481541	DIODE, 100V, 1A	1
004	5918-10	XFMR, MAINS, PWR SPL	1
017	470026	RESISTOR, 150 OHM	1
023	472058	RESISTOR, lOOK OHM	3
018	472005	RESISTOR, 249 OHM	1
043	600034	RIBBON CABLE ASSY	1
030	474181	RESISTOR, 4.3 OHM	1
039	486716	LM393N DUAL COMPARATOR	1
022	472049	RESISTOR, 49.9K OHM	1
019	472016	RESISTOR, 2.21K OHM	1
038	485527	MOSFET, IRF9523	1
031	481022	DIODE, ZENER, BZY88C	1
026	472146	RESISTOR, 47.5K OHM	1
042	515503	FUSE HOLDER, FOR 5MM	4
021	472030	RESISTOR, 10K OHM	1

Seq	Item Nbr	Description	Qty
015	211213	CONNECTOR, 2 PIN	1
013	154016	CAPACITOR, .1UF	5
011	152029	CAPACITOR, 220UF	1
025	472109	RESISTOR, 37.4K OHM	1
029	472270	RESISTOR, 1.2M OHM	1

5719-01 FRONT PANEL ASSY 18.7

Seq	Item Nbr	Description	Qty
006	280033	SPACER *4 X 1/8	0
003	5720-01	DISPLAY ASSY	1
001	2473-01	ALERT BOARD ASSY	1
010	285000	LOCK WASHER, NO. 4	0
002	5676-27	MEMBRANE KEYPANEL	1
008	284200	*4-40 X 1/4 SLOTTED	0
007	280187	STANDOFF, .187 DIA	0
004	6278-10	SHIELD, VFD	1
009	284204	*4-40 X 1/2 SLOTTED	0

2473-01 ALERT BOARD ASSY 18.8

Seq	Item Nbr	Description	Qty
006	482565	LED, CLEAR, ROUND	4
005	470024	RESISTOR, 100 OHM	2
007	600038	RIBBON CABLE ASSY	1
001	2473-02	FAB, ALERT BOARD	1

5720- 01 DISPLAY ASSY 18.9

Seq	Item Nbr	Description	Qty
001	482573	LCD MODULE, DOT MATRIX	1
002	600033	RIBBON CABLE ASSY	1

5713-01 SPEAKER ASSY 18.10

Seq	Item Nbr	Description	Qty
001	130010	SPEAKER, 8 OHM 15%,	1
002	211225	CONNECTOR, 2 PIN	1
005	5855-10	FOAM LINER	1
004	608003	TUBING, HEAT SHRINK	0
003	605060	WIRE, 26AWG, PVC INS	0

5714-01 BATTERY HARNESS ASSY 18.11

Seq	Item Nbr	Description	Qty
004	605163	WIRE, 22AWG, BLACK	0

Seq	Item Nbr	Description	Qty
001	211215	CONNECTOR, 2 PIN	1
002	216068	TERMINAL LUG, RECEPT	0
005	608001	CABLE TIE	0
003	605162	WIRE, 22AWG, RED	0

5728-01 CABLE ASSY 18.12

Seq	Item Nbr	Description	Qty
004	211704	CONNECTOR, RCPT	1
011	605063	WIRE, 26AWG, PVC INS	0
015	608005	TUBING, HEAT SHRINK	0
006	210098	CONTACT, FEMALE	0
008	605059	WIRE, 26AWG, PVC INS	0
007	280108	SNAP RIVET	0
001	5606-16	DRESS BEZEL, SAO2 IN	1
014	608001	CABLE TIE	0
010	605061	WIRE, 2EAWG, PVC INS	0
003	180009	FERRITE SLEEVE	1
013	605065	WIRE, 26AWG, PVC INS	0
012	605064	WIRE, 26AWG, PVC INS	0
002	161060	EPOXY, 2 PART (5/7)	0
005	211630	CONNECTOR, 6 PIN	1
009	605060	WIRE, 26AWG, PVC INS	0
016	608011	TUBING, HEAT SHRINK	0
002	161110	EPOXY, 2 PART (1/1)	0
017	9779-33	ASSY PROC, EPOXY MIX	0

5765-01 TOP COVER ASSY 18.13

Seq	Item Nbr	Description	Qty
005	5862-10	SHIELD, MYLAR	1
001	5765-13	TOP COVER	1
002	5827-32	WARNING LABEL	1
004	5823-32	LABEL, INSTRUCTIONS	1
003	5828-32	LABEL, ISOLATION	1

5766-01 BOTTOM COVER ASSY 18.14

Seq	Item Nbr	Description	Qty
016	161007	ADHESIVE	0
010	284261	SCREW, 4-40 X 5/8 L	0
009	4727-10	KICKSTAND, BEDRAIL	1
005	5826-10	FOOT PAD	4
003	5766-13	BOTTOM COVER	1
015	284264	SCREW, 4-40 X 1/4 L	0
011	161064	TAPE, 3/4 X 60 YDS	0
012	5405-10	SHIELD, BATTERY	1

Seq	Item Nbr	Description	Qty
007	5760-16	LEFT FOOT, WHITE	2
008	5761-16	RIGHT FOOT, WHITE	2
013	5849-10	BRACKET, SUPPORT	1
002	5409-32	LABEL, WARNING, POLE	1
006	315052	LABEL, EARTHING SYMB	13

2755-01 TONE GEN REPL BOARD 18.15

Seq	Item Nbr	Description	Qty
022	486358	IC, NC7SZ32MS, 2-IN	1
018	474241	RESISTOR, 150K OHM	1
023	486825	IC, LMC7101BIM5X	1
020	474300	RESISTOR, 402K OHM	1
014	474228	RESISTOR, 1.21K OHM	1
001	2755-02	FAB, TONE GENERATOR	1
017	474240	RESISTOR, lOOK OHM	3
012	474197	RESISTOR, 49.9K OHM	1
013	474224	RESISTOR, 100 OHM	1
011	211814	CONNECTOR, 8 PIN	2
010	154104	CAPACITOR, .O1UF	4
002	2755-03	SCHEM, TONE GEN REPL	0
003	9074-07	IC, TONE GENERATOR	1
016	474235	RESISTOR, 24.9K OHM	2
019	474270	RESISTOR, 200K OHM	1
011	211815	CONN, 8 PIN, HDR	2

2775-01 MAIN BOARD ASSY 18.16

Seq	Item Nbr	Description	Qty
000	472121	RESISTOR, 3.74K OHM	1
000	483017	TRANSISTOR, BC214C	4
000	474032	RESISTOR, 10 OHM	1
000	472041	RESISTOR, 20K OHM	2
000	472063	RESISTOR, 162K OHM	1
000	472200	RESISTOR, 5.6 OHM	1
000	487064	IC, CNY17-III, PHOTO	4
000	154058	CAPACITOR, .022UF	1
000	472011	RESISTOR, 1K OHM	5
000	474089	RESISTOR PACK, lOOK	2
000	474131	RESISTOR PACK, 10K	1
000	211306	CONNECTOR, 3 PIN	1
000	180033	EMI FILTER, 22PF	1
000	472255	RESISTOR, 1 OHM	2
000	154065	CAP, .1UF, 63V	5
000	152040	CAPACITOR, 2.2UF	3
000	472007	RESISTOR, 475 OHM	6
000	154081	CAPACITOR, 100PF	5

Seq	Item Nbr	Description	Qty
000	472021	RESISTOR, 4.75K OHM	1
000	210144	JUMPER, 2 POSITION	1
000	153003	CAPACITOR, .O1UF	1
000	472193	RESISTOR, 23.7K OHM	1
000	481541	DIODE, bOy, 1A	4
000	475034	POTENTIOMETER, 2K OHM	1
000	483002	2N3906 PNP SILICON	1
000	472058	RESISTOR, lOOK OHM	7
000	154060	CAPACITOR, .22UF,	1
000	481501	DIODE, 1N4148, SIGNAL	9
000	472274	RESISTOR, 26.7 OHM	1
000	472105	RESISTOR, 3.92K OHM	2
000	470109	RESISTOR, 470K OHM	1
000	481534	DIODE, BAT82, SCHOTT	2
000	2471-28	MAIN BD KIT	1
000	472227	RESISTOR, 47 OHM	2
009	285000	LOCK WASHER, NO. 4	0
000	474134	RESISTOR PACK, 41K	1
000	486299	IC, CS5SO3JP, 20-BIT	2
000	472170	RESISTOR, 22.1K OHM	1
000	474132	RESISTOR PACK, 41K	2
000	472276	RESISTOR, 6.49K OHM	2
000	470016	RESISTOR, 22 OHM	1
000	472268	RESISTOR, 8.66K OHM	1
000	5833-01	GROUND WIRE ASSY	1
000	472003	RESISTOR, 100 OHM	2
000	472146	RESISTOR, 47.5K OHM	1
000	152072	CAPACITOR, 1OUF	1
000	472246	RESISTOR, 66.5K OHM	2
000	472198	RESISTOR, 3.3 OHM	1
000	474098	RESISTOR PACK, lOOK	4
000	153027	CAPACITOR, 220PF	1
000	472030	RESISTOR, 10K OHM	7
000	474133	RESISTOR PACK, 10 OH	1
000	474086	RESISTOR PACK, 10K	1
000	472034	RESISTOR, 12.1K OHM	1
000	153063	CAPACITOR, 220PF	2
000	152075	CAPACITOR, 47UF, 25V	2
000	474138	RESISTOR, 100 OHM,	4
000	154016	CAPACITOR, .1UF	59
000	216029	TEST POINT, SPRING	2
000	152045	CAPACITOR, 1OUF 16V	6
000	153052	CAPACITOR, .022UF	1
000	152073	CAPACITOR, 100UF	4
007	280023	SPACER HEX #4-40	0
000	153021	CAPACITOR, .47UF	1
000	472195	RESISTOR, 41.2K OHM	4
000	180011	FERRITE BEAD, 22 AWG	1

Seq	Item Nbr	Description	Qty
000	153051	CAPACITOR, .22UF,	1
000	474135	RES PACK, 100 OHM	1
000	481031	DIODE, ZENER, BZX79-	1
001	2755-01	TONE GEN REPL BOARD	1
000	472037	RESISTOR, 13.7K OHM	2
008	284217	SCREW, 4-40 X 3/16	0
000	180067	FERRITE BEAD, 600 uH	15
000	215080	SOCKET, 32 PIN, PLCC	1
000	481050	ESD SUPPRESSOR	2
002	2775-02	FAB, MAIN BD	1
000	212136	CONN, 10 PIN, HDR	1
000	5715A-07	PROGRAM, SPO2, 520A	1
000	211237	CONNECTOR, 2 PIN	1
000	486845	IC, 2.SV OR 3.OV V R	1
006	161039	FOAM TAPE, 1/32THK	0
010	5712-10	TRANSFORMER, MAIN BD	1
010	5711-10	TRANSFORMER, MAIN BD	0

2471-28 MAIN BD KIT (part of 2775-01) 18.17

Seq	Item Nbr	Description	Qty
001	180012	FERRITE BEAD	1
000	484535	VOLTAGE REGULATOR, L	1
000	486295	IC, MM74HC4OS1N	1
000	484534	VOLTAGE REGULATOR	1
000	486625	MC74HC32N I.C. QUAD	3
000	211414	CONNECTOR, 4 PIN	1
000	152085	CAPACITOR, 1500UF	2
000	515511	FUSEHOLDER, VERT	2
000	484533	VOLTAGE RGLTR	1
000	484523	VOLTAGE REGULATOR	1
000	484529	VOLTAGE REGULATOR	1
000	487061	IC, TBA82OM, MONOLIT	1
000	486300	IC, TLC549IP, 8-BIT	1
000	487069	IC, LT1O19CN8-2.5	1
000	486712	TLO74CN QUAD F FET	2
000	152086	CAPACITOR, 1000UF	2
000	485528	MOSFET, N-CH	1
000	486651	MM74HC138 I.C.	1
000	471400	RESISTOR, lOOM OHM	1
000	153006	CAPACITOR, 47PF, 63V	4
000	486298	IC, MM74HC4O2ON	1
000	486680	IC, MM74HC573AN	4
000	9715-07	PROGRAM, PEEL ASSY	1
000	9716-07	PROGRAM, PEEL ASSY	1
000	154076	CAPACITOR, .O1UF	2
000	481542	DIODE, UF5400	1
000	215060	SOCKET, IC, 32 PLN	1

Seq	Item Nbr	Description	Qty
000	230006	CRYSTAL,3.2768MHZ	1
000	152084	CAPACITOR, 470UF	2
000	230018	CRYSTAL, 12.288MHZ	1
000	486268	IC, DG444DJ, SPST	1
000	486305	IC, MSM6242BRS, CMOS	1
002	153013	CAPACITOR, 33PF	3
02A	153013	CAPACITOR, 33PF	1
000	210097	CONNECTOR, 16 PIN	1
000	230016	CRYSTAL, 32.768K HZ	1
000	486600	IC, CD4O13B	1
000	484531	VOLTAGE REGULATOR	1
000	486285	IC, HD64180R1P6	1
000	515071	FUSE, 1/1OA, 125V	1
000	180010	INDUCTOR, 18UH	1
003	153012	CAPACITOR, 22PF	4
03A	153012	CAPACITOR, 22PF	6
000	212501	CONNECTOR, 20 PIN	1
000	486675	MM74HC14N, IC,CMOS	2
000	486685	IC, DUAL 8-BIT	1
000	486256	IC, K6TO8O8C1D-DB7O	1
000	485529	TRANSISTOR, VNO61OL	7
000	154057	CAPACITOR, 470pF	1
000	485527	MOSFET, 1RF9523	1
000	211412	CONNECTOR, 4 PIN	1
000	484014	NPN TRANSISTOR ZTX1O	1
000	486276	IC, LT1O81CN	1
000	180004	CHOKE, 100UH, 10%	1
000	215031	SOCKET, 20 PIN, DIP	2
000	211213	CONNECTOR, 2 PIN	2
000	211629	CONNECTOR, 6 PIN	1
000	470111	RESISTOR, .33 OHM	3
000	153046	CAPACITOR, 4700PF	1
000	486606	CD4O93BE	1
000	152066	CAPACITOR, 220uF	1
000	485520	TRANSISTOR, BS2SO	2
000	212529	CONNECTOR, 20 PIN	1
000	484515	LM317LZ REGULATOR	1
000	215055	SOCKET, IC	1
000	515072	FUSE, 1A, 125V	1
000	487065	IC, UC3843N, CURRENT	1
000	400035	IN\JERTER, DC TO AC	1
000	210051	CONNECTOR, 25 PIN	1
000	180011	FERRITE BEAD, 22 AWG	1
004	487053	IC, AD712JN, DUAL BI	2
004	486717	LF353N	2

2471-01 MAIN BOARD ASSY

18.18

Seq	Item Nbr	Description	Qty
067	472121	RESISTOR, 3.74K OHM	1
153	483017	TRANSISTOR, BC214C	4
082	474032	RESISTOR, 10 OHM	1
062	472041	RESISTOR, 20K OHM	2
064	472063	RESISTOR, 162K OHM	1
073	472200	RESISTOR, 5.6 OHM	1
130	487064	IC, CNY17-III, PHOTO	4
151	154058	CAPACITOR, .022UF	1
057	472011	RESISTOR, 1K OHM	5
083	474089	RESISTOR PACK, lOOK	2
009	6344-07	PROGRAM, EPROM ASSY	0
085	474131	RESISTOR PACK, 10K	1
149	472255	RESISTOR, 1 OHM	2
032	154065	CAP, .1UF, 63V	5
150	486255	IC, SN76496AN	1
011	152040	CAPACITOR, 2.2UF	3
056	472007	RESISTOR, 475 OHM	6
002	2471-03	SCHEMATIC, MAIN BD	0
058	472021	RESISTOR, 4.75K OHM	1
004	5715-07	PROGRAM, SPO2, 520A	1
001	2471-02	FAB, MAIN BOARD	1
020	153003	CAPACITOR, .O1UF	1
070	472193	RESISTOR, 23.7K OHM	1
094	481541	DIODE, bOy, 1A	4
090	475034	POTENTIOMETER, 2K	1
096	483002	2N3906 PNP SILICON	1
063	472058	RESISTOR, lOOK OHM	7
155	153062	CAPACITOR, 15OPF	3
152	154060	CAPACITOR, .22UF	1
092	481501	DIODE, 1N4148, SIGNAL	10
080	472274	RESISTOR, 26.7 OHM	1
066	472105	RESISTOR, 3.92K OHM	2
079	472272	RESISTOR, 59K OHM	1
093	481534	DIODE, BAT82, SCHOTT	2
008	2471-28	MAIN BD KIT	1
075	472227	RESISTOR, 47 OHM	2
088	474134	RESISTOR PACK, 41K	1
003	5712-10	TRANSFORMER, MAIN BD	1
117	486299	IC, CSS5O3JP, 20-BIT	2
069	472170	RESISTOR, 22.1K OHM	1
086	474132	RESISTOR PACK, 41K	2
081	472276	RESISTOR, 6.49K OHM	2
077	470016	RESISTOR, 22 OHM	1
078	472268	RESISTOR, 8.66K OHM	1
138	5833-01	GROUND WIRE ASSY	1
055	472003	RESISTOR, 100 OHM	4

Seq	Item Nbr	Description	Qty
068	472146	RESISTOR, 47.5K OHM	1
014	152072	CAPACITOR, 1OUF	1
076	472246	RESISTOR, 66.5K OHM	2
072	472198	RESISTOR, 3.3 OHM	1
010	6266-57	PROGRAM, DISK ASSY	0
084	474098	RESISTOR PACK, lOOK	4
148	153027	CAPACITOR, 220PF	1
059	472030	RESISTOR, 10K OHM	6
087	474133	RESISTOR PACK, 10 OHM	1
145	474086	RESISTOR PACK, 10K	1
003	5711-10	TRANSFORMER, MAIN BD	0
060	472034	RESISTOR, 12.1K OHM	1
025	153038	CAPACITOR, .OO1UF	1
016	152075	CAPACITOR, 47UF, 25V	2
028	154016	CAPACITOR, .1UF	59
142	216029	TEST POINT	2
012	152045	CAPACITOR, 1OUF 16v	6
144	153052	CAPACITOR, .022UF	1
015	152073	CAPACITOR, 100UF	4
024	153021	CAPACITOR, .47UF	1
071	472195	RESISTOR, 41.2K OHM	4
027	153051	CAPACITOR, .22UF	1
089	474135	RES PACK, 100 OHM	1
091	481031	DIODE, ZENER	1
154	2755-01	TONE GEN REPL BOARD	1
061	472037	RESISTOR, 13.7K OHM	2

19 Schematic and Assembly Drawings

Drawing	Description
5693-09	Overall Wiring Diagram
2726-01	PSU Board Assy
2726-03	PSU Board Schematic
2472-01	PSU Board Assy
2472-03	PSU Board Schematic
5693-01	Oximeter Unit Assy
2471-01	Main Board Assy
2471-03	Main Board Schematic
2775-01	Main Board Assy
2775-03	Main Board Schematic
2755-01	Tone Generator Replacement Bd
2755-03	Tone Generator Replacement Bd
5728-01	Cable Assy, SpO2 Input
2473-03	Alert Lamp Board
5676-27	Keypanel Schematic
5693-00	Main Assy, Model 520A
	Optional Analog Module
9622-01	Analog/RS232 Module
2289-01	Analog/RS232 Bd. Assy
2289-03	Analaog/RS232 Bd. Schematic

Table 5. Schematic and Assembly Drawings

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PM301
POWER ENTRY MODULE
CONFIGURED FOR 120V AC

J304
L
PE
N
POWER INPUT
100/120V AC
50/60 Hz

S101
G
H
F101
1/2A 250V
SLO-BLO
F102
1/2A 250V
SLO-BLO
VOLTAGE
SELECTOR

(A) J305 P305
(B) J306 P306
(C) J307 P307
(D) J308 P308

BRN
BRN
BLU
BLU

P301 J301
5
4
2
1

6
2
5
1

T301
8
11

F302
1A
V FAST-ACT
J302 P302
B5714-01

P306 J306
P305 J305
BT301
12V DC

POWER SUPPLY BD
D2726-03

F301
2A
SLO-BLO
E302

(GND)
REAR
PANEL

ISOLATION BARRIER

GRN/YEL
GL301
(INTERIOR)
GRN/YEL
GL201
BOTTOM COVER
GRN/YEL
GL303
(EXTERIOR)
GRN/YEL
GL302
(INTERIOR)
RIGHT ANGLE
MOUNTING BRKT

P102
J102

LS201
B5713-01
P109 J109

F1
1A
SLO-BLO

J104 P104
J105 P105
J107 P107
J106 P106
J108 P108

J103
E1

MAIN BOARD
D2471-03

RS232C/
NOVAMETRIX
ACCESSORIES
J101

TONE GENERATOR
BOARD
B2755-03

F2
100mA
FAST ACTING

C5728-01
J1
Sp02
INPUT

FRONT PANEL
C5719-01
EMI/RFI SHIELDING
MEMBRANE
KEYPANEL
D5676-27
ALERT BOARD
C2473-03
DISPLAY ASSY
C5720-01
FRONT
PANEL

EMI/RFI SHIELDING

REV	R NO.	DATE
04	N557	27May98
03	N547	10Feb98
02	N377	19Apr96
01	N375	16Nov95

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ~ (mm) ± ~
FRAC ± ~ (mm) ± ~
HOLES ±.007 -.003 (mm) (±.18 -.08)
ANG ± ~
MATERIAL ~
FINISH ~

TITLE
OVERALL WIRING
DIAGRAM,
OXYPLETH - 520A

DRAWN MRL 3Feb92
CHECKED AE 29APR92
MFG ENGR EH 29APR92
APPROVED AK 29APR92
USED ON: D5693-00

NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE D | DRAWING NO. 5693 | CODE 09 | REV 04
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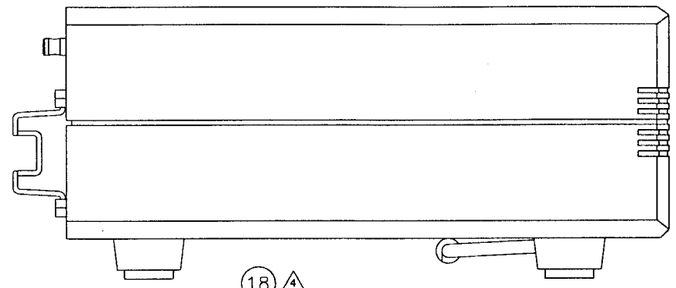
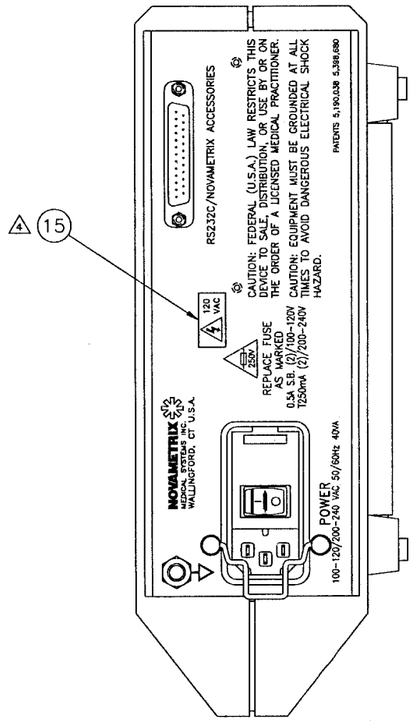
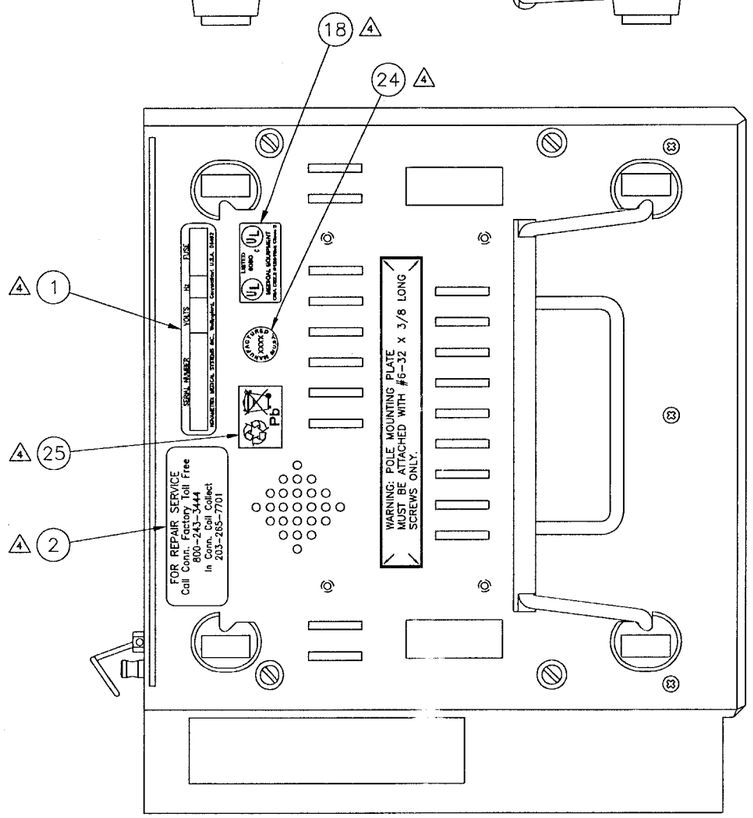
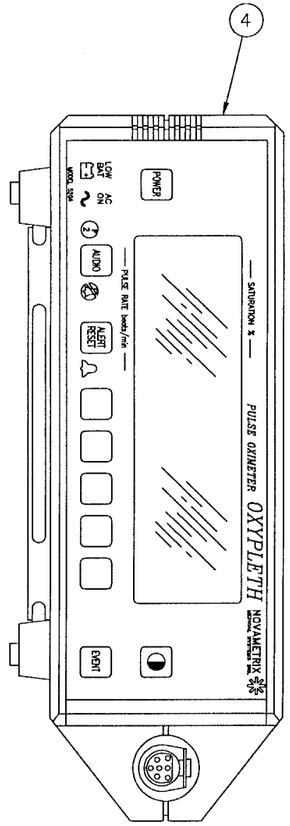
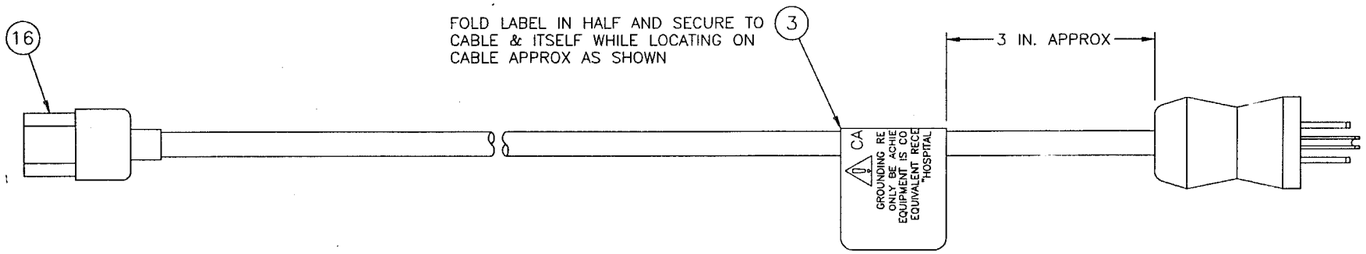



RS232C/NOVAMETRIX ACCESSORIES
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK HAZARD.
PATENTS 5,190,038 5,368,680
120 VAC
REPLACE FUSE AS MARKED
0.5A S.B. (2)/100-120V
T250mA (2)/200-240V
NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A.
POWER
100-120/200-240 VAC 50/60Hz 40VA


SERIAL NUMBER
FOR REPAIR SERVICE
Call Cont. Factory, Toll Free
800-243-4464
In Conn, Call Collect
203-265-7701
WARNING: POLE MOUNTING PLATE MUST BE ATTACHED WITH #6-32 X 3/8 LONG SCREWS ONLY.




FOLD LABEL IN HALF AND SECURE TO CABLE & ITSELF WHILE LOCATING ON CABLE APPROX AS SHOWN
3 IN. APPROX
GROUNDING RE
ONLY BE ACHIE
EQUIPMENT IS CO
EQUIVALENT RECE
HOSPITAL

NOTES:

1. WIPE UNIT CLEAN WITH ISOPROPYL ALCOHOL.
2. FOR OVERALL WIRING DIAGRAM SEE D5693-09.
3. ACCESSORY SIDE POUCH, ITEM 17, IS NOT SHOWN. INCLUDE POUCH WITH MONITOR BUT DO NOT ATTACH.
4. LOCATE LABELS APPROXIMATELY AS SHOWN.
5. FOR TEST PROCEDURE SEE A5693-04.
6. FOR QA INSPECTION PROCEDURE SEE A5693-70.
7. INCLUDE USERS MANUAL, ITEM 6 WITH MONITOR.

REV	R NO.	DATE
13	N820	21Nov00
12	N758	18May00
11	N727	27Jan00
10	N724	26Jan00
09	N557	27May98
08	N547	12Feb98
07	N449	14Mar97
06	N427	10Jan97
05	N418	2Dec96
04	N375	16Nov95
03	N368	17May95
02	N316	24Mar93
01	N304	9Sep92

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ~ (mm) ± ~
FRAC ± ~ (mm) ± ~
HOLES +.007 -.003 (mm) (+.18 -.08)
ANG ± ~
MATERIAL ~
FINISH ~

TITLE: PULSE OXIMETER, OXYPLETH - 520A

DRAWN CW 20Apr92 | CHECKED MRL
MFG ENGR EH 22May92 | APPROVED AK 22May92
USED ON: ~

NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
D	5693	00	13

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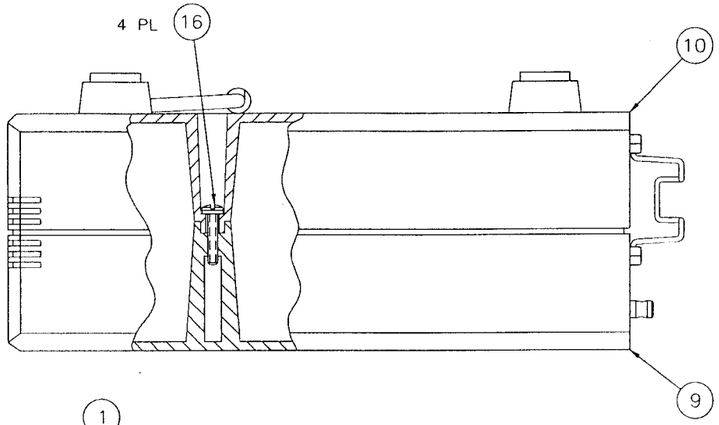

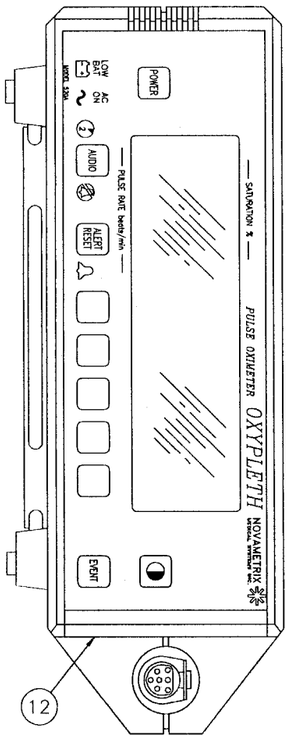

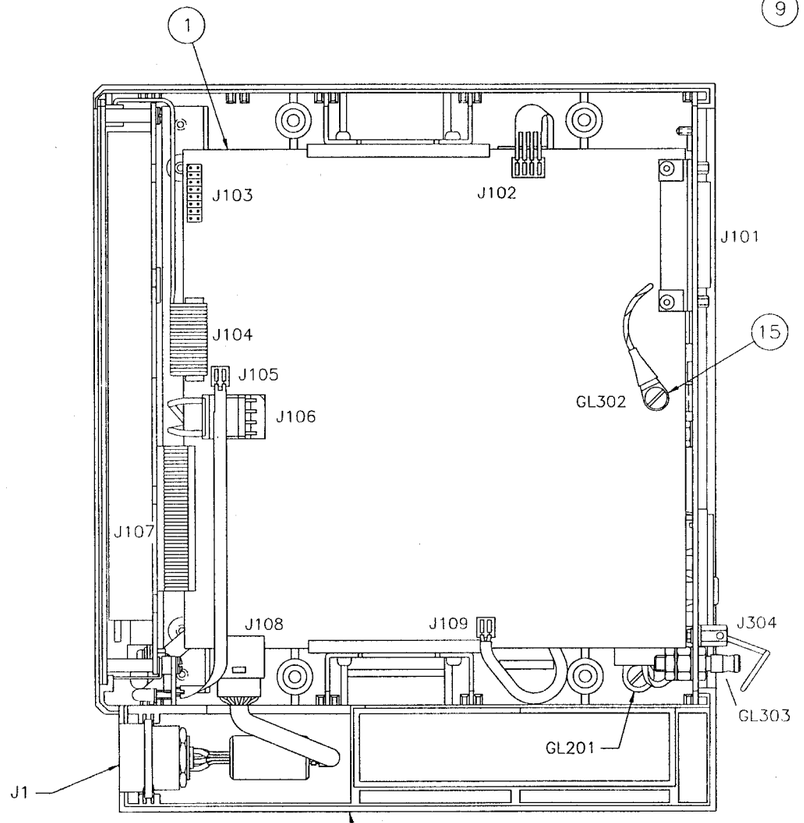

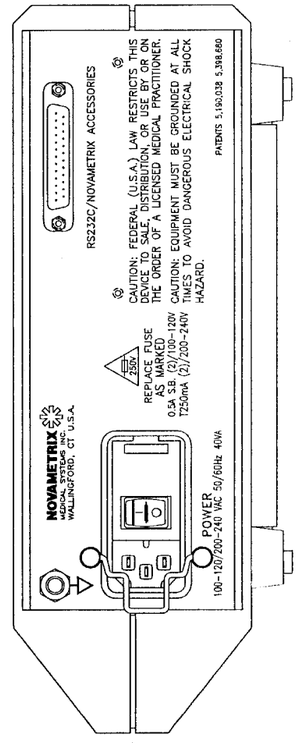
RS232C/NOVAMETRIX ACCESSORIES
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CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK HAZARD.
PATENTS 5,190,038 5,398,680
REPLACE FUSE AS MARKED 0.5A SLO-BLO® T250mA
100-120V
(2)200-240V
POWER
100-120/200-240 VAC 50/60Hz 40VA
NOVAMETRIX
WALLINGFORD, CT U.S.A.

SEE SHEET 2 FOR SUBASSY.
THIS VIEW SHOWN WITHOUT TOP COVER

REV	R NO.	DATE
13	N727	17Jan00
12	N557	26May98
11	N547	12Feb98
10	N427	10Jan97
09	N418	2Dec96
08	N377	10Jan96
07	N375	13Nov95
06	N366	19May95
05	N341	11Jan94
04	N325	15Jul93
03	N316	24Mar93
02	N304	150ct92
01	N302	26May92

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ~ (mm) ± ~
FRAC ± ~ (mm) ± ~
HOLES +.007 -.003 (mm) (+.18 -.08)
ANG ± ~
MATERIAL ~
FINISH ~

TITLE
MAIN ASSEMBLY, MODEL 520A

DRAWN CW 29Apr92 | CHECKED MRL
MFG ENGR EH 22May92 | APPROVED AK 22May92
USED ON: 05693-00

NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
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SCALE: 1/1 | SHEET 1 OF 2

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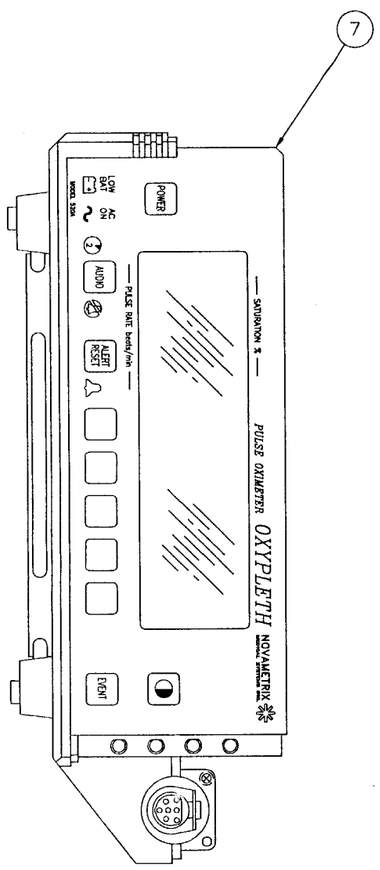

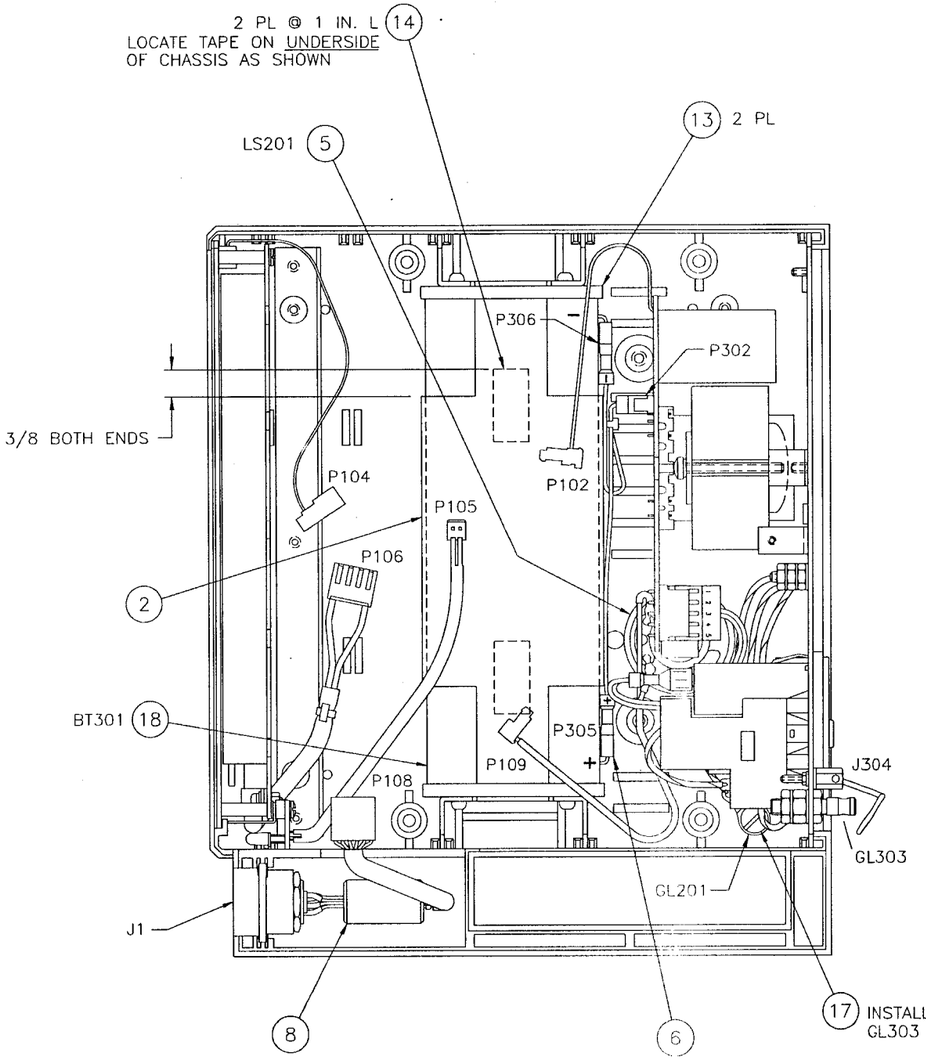

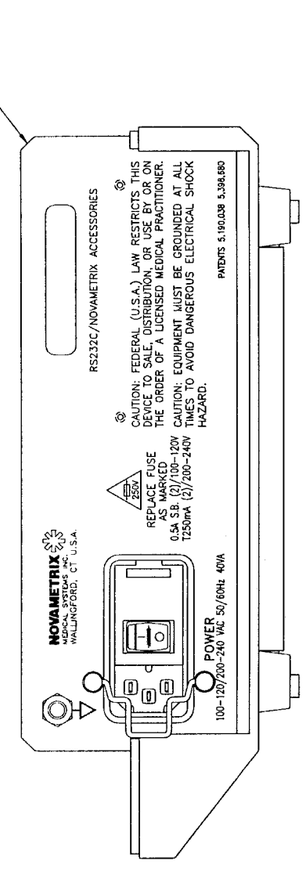
3
RS232C/NOVAMETRIX ACCESSORIES
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK HAZARD.
PATENTS 5,190,038 5,398,680
REPLACE FUSE AS MARKED 0.5A SB (100/110-120V) T250mA (D)/200-240V
NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A.
POWER 100-120/200-240 VAC 50/60Hz 40VA

DETAIL A

			07	N375	13Nov95	DO NOT SCALE UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm) BREAK ALL SHARP EDGES TOLERANCES DEC ± ~ (mm) ± ~ FRAC ± ~ (mm) ± ~ HOLES +.007 -.003 (mm) (+.18 -.08) ANG ± ~ MATERIAL ~ FINISH ~	TITLE: MAIN ASSEMBLY, MODEL 520A
13	N727	17Jan00	06	N366	19May95		
12	N557	26May98	05	N341	11Jan94		
11	N547	12Feb98	04	N325	15Jul93		
10	N427	10Jan97	03	N316	24Mar93		
09	N418	20Dec96	02	N304	15Oct92		
08	N377	10Jan96	01	N302	26May92		
REV	R NO.	DATE	REV	R NO.	DATE		

NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A. 06492

DRAWN	CHECKED
CW 29Apr92	MRL
MFG ENGR EH 22May92	APPROVED AK 22May92

USED ON: D5693-00

SIZE	DRAWING NO.	CODE	REV
D	5693	01	13

SCALE: 1/1 SHEET 2 OF 2

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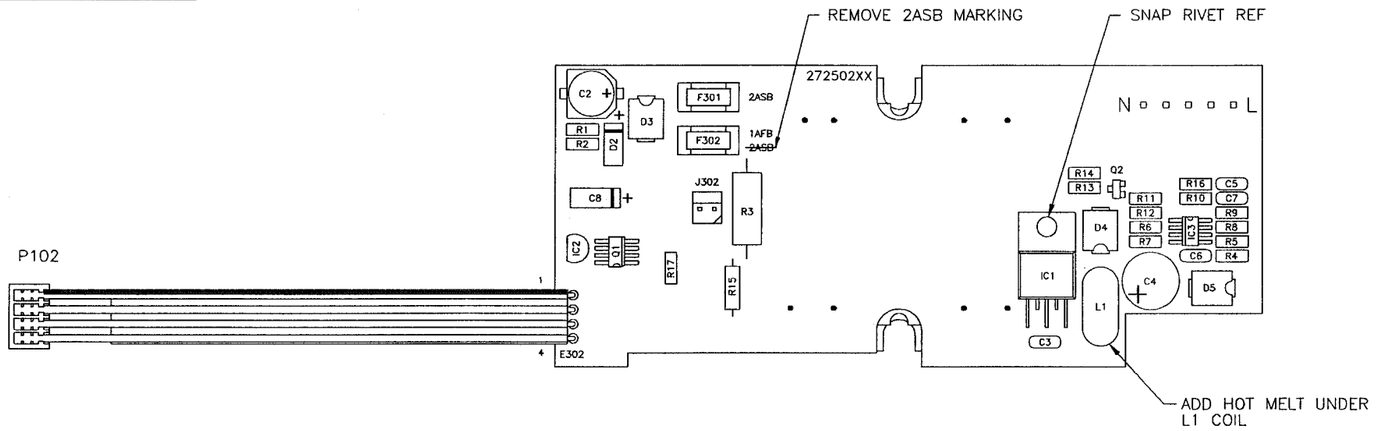
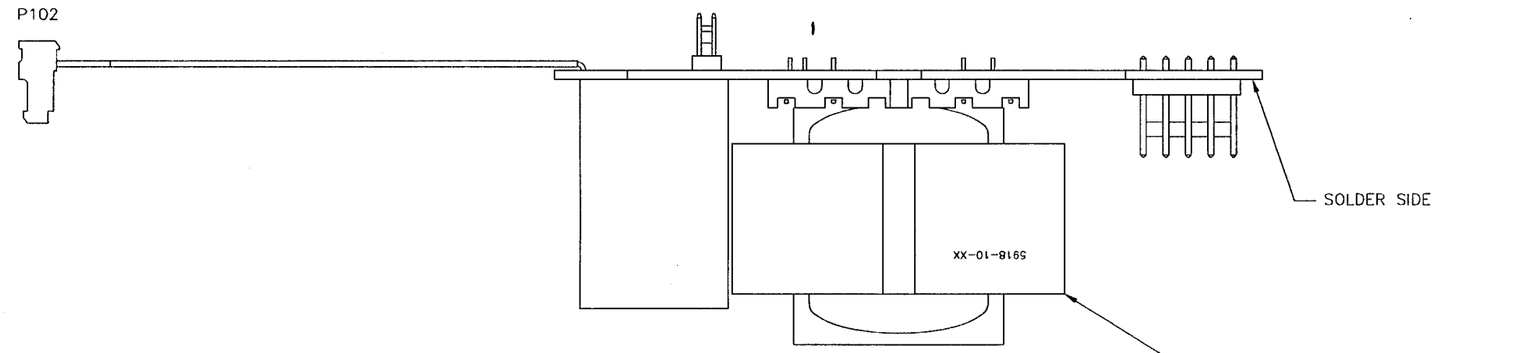
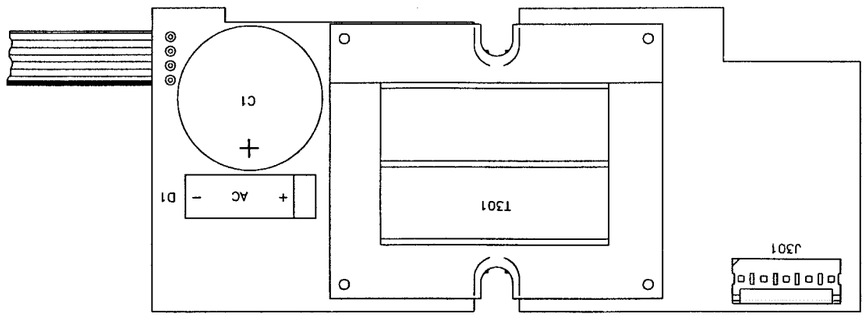






PN	DESCRIPTION	REF DES
		1
2725-02	FAB, POWER SUPPLY BOARD, 2ND GENERATION	~
D2726-03	SCHEMATIC, POWER SUPPLY BOARD	~
A2726-04	TEST PROCEDURE, POWER SUPPLY BOARD	~
☆D5918-10	TRANSFORMER, MAINS, POWER SUPPLY BOARD	T301
☆ 152029	CAPACITOR, 220uF 20%, 35V, ELECTROLYTIC	C4
☆ 152081	CAPACITOR, 6800uF, 35V, 20%, ELECTROLYTIC	C1
152096	CAPACITOR, 220uF, 35V, 20%, ELECTROLYTIC	C2
154072	CAPACITOR, .1uF, 50V, 10%, X7R, CERAMIC CHIP	C3, C5-C7
154079	CAPACITOR, 10uF, 25V, 10%, TANTALUM	C8
☆ 180014	INDUCTOR, 25uH, .25 SPACING	L1
☆ 211213	CONNECTOR, 2 PIN, POST HEADER	J302
☆ 211505	CONNECTOR, 5 PIN, SQUARE POST HEADER	J301
280114	SNAP RIVET, .118-.158 THK PANEL	FOR IC1
☆470026	RESISTOR, 150 OHM, 1/4W, 10%	R15
474137	RESISTOR, 1M OHM, 1/8W, 1%	R1
474141	RESISTOR, 249k OHM, 1/8W, 1%	R2
474145	RESISTOR, 215 OHM, 1/8W, 1%	R11
474151	RESISTOR, 37.4k OHM, 1/8W, 1%	R6
474162	RESISTOR, 61.9k OHM, 1/8W, 1%	R13
474165	RESISTOR, 10k OHM, 1/8W, 1%	R10
474166	RESISTOR, 100k OHM, 1/8W, 1%	R5, R7, R9, R17
474211	RESISTOR, 49.9k OHM, 1/8W, 1%	R4
474214	RESISTOR, 332k OHM, 1/8W, 1%	R14
474215	RESISTOR, 2.21k OHM, 1/8W, 1%	R16
474216	RESISTOR, 4.99k OHM, 1/8W, 1%	R12
474218	RESISTOR, 47.5k OHM, 1/8W, 1%	R8
☆474341	RESISTOR, 4.3 OHM, 3W, 5%	R3
☆ 481530	DIODE, 4 AMP, BRIDGE RECTIFIER	D1
481549	DIODE, RECTIFIER	D2
481561	DIODE, ULTRAFAST, 100V, 3A	D4
481563	DIODE, SCHOTTKY, 100V, 5A	D3, D5
☆ 484529	VOLTAGE REGULATOR, 5V, 100MA	IC2
☆ 484559	VOLTAGE REGULATOR, FLOW 30, 2A	IC1
485532	TRANSISTOR, N-CHANNEL, ENHAN MODE	Q2
485543	TRANSISTOR, MOSFET, N-CHANNEL & P-CHANNEL	Q1
486805	IC, DUAL VOLTAGE COMP, LOW POWER	IC3
515083	FUSE W FUSEHOLDER, 1A, 125V, V FAST-ACTING	F302
515085	FUSE WITH FUSEHOLDER, 2A, 125V, SLO-BLO	F301
600034	RIBBON CABLE ASSY, 4 PIN, 4 INCHES LONG	P102

NOTES:
1. ☆ DENOTES THRU HOLE COMPONENTS.
2. FOR TEST PROCEDURE SEE A2726-04.

REV	R NO.	DATE
06	N675	28Jun99
05	N671	1Jun99
04	N616	3Nov98
03	N508	29Aug97
02	N433	29Jan97
01	N377	26Dec95
00	N372	29Sep95

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ~ (mm) ± ~
FRAC ± ~ (mm) ± ~
HOLES +.007 -.003 (mm) (+.18 -.08)
ANG ± ~
MATERIAL ——
FINISH ——

TITLE
POWER SUPPLY BOARD ASSY, MODEL 515A SB, 520A, 1265 & 7100

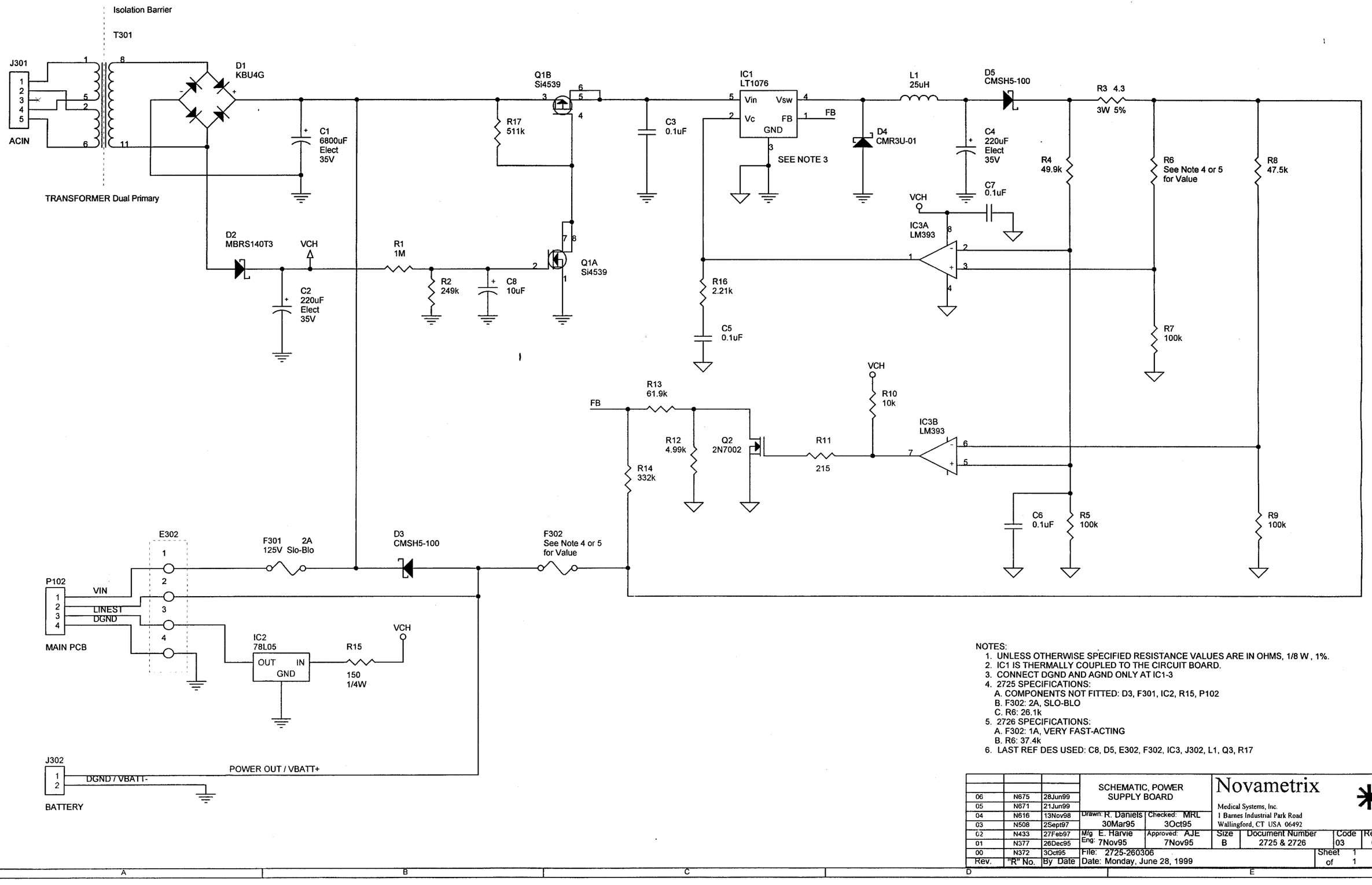
DRAWN	CHECKED
RGG 7Aug95	BL 7Nov95
MFG ENGR EH 11-8-95	APPROVED AJE 9Nov95

USED ON: ~

NOVAMETRIX MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
D	2726	01	06

SCALE: 2/1 SHEET 1 OF 1



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE VALUES ARE IN OHMS, 1/8 W , 1%.
2. IC1 IS THERMALLY COUPLED TO THE CIRCUIT BOARD.
3. CONNECT DGND AND AGND ONLY AT IC1-3
4. 2725 SPECIFICATIONS:
   A. COMPONENTS NOT FITTED: D3, F301, IC2, R15, P102
   B. F302: 2A, SLO-BLO
   C. R6: 26.1k
5. 2726 SPECIFICATIONS:
   A. F302: 1A, VERY FAST-ACTING
   B. R6: 37.4k
6. LAST REF DES USED: C8, D5, E302, F302, IC3, J302, L1, Q3, R17

Rev.	"R" No.	By Date
06	N675	28Jun99
05	N671	21Jun99
04	N616	13Nov98
03	N508	2Sept97
02	N433	27Feb97
01	N377	26Dec95
00	N372	3Oct95

SCHEMATIC, POWER SUPPLY BOARD

Novametrix
Medical Systems, Inc.
1 Barnes Industrial Park Road
Wallingford, CT USA 06492

Drawn: R. Daniels 30Mar95 | Checked: MRL 3Oct95
Mfg Eng: E. Harvie 7Nov95 | Approved: AJE 7Nov95

Size	Document Number	Code	Rev
B	2725 & 2726	03	06

File: 2725-260306
Date: Monday, June 28, 1999
Sheet 1 of 1

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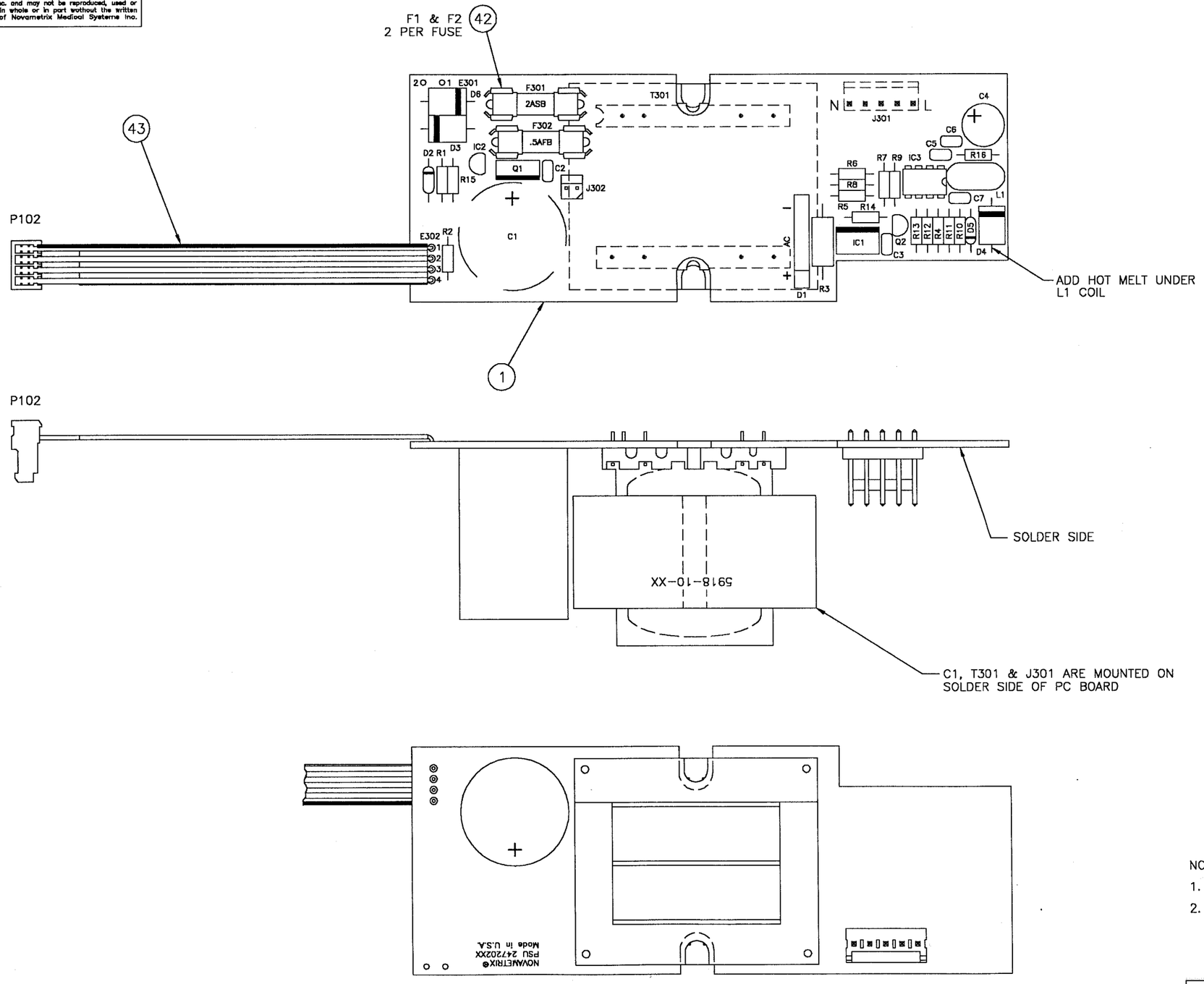

PN	DESCRIPTION	REF DES
5918-10	TRANSFORMER, MAINS	T301
152029	CAPACITOR, 220uF, 35V, ELECTROLYTIC	C4
152081	CAP, 6800uF, 35V, ±20%, AL, ELECTROLYTIC	C1
154016	CAPACITOR, .1uF, 50V, DIPPED CERAMIC	C2, C3, C5-C7
180014	INDUCTOR, 25uH	L1
211213	CONNECTOR, 2 PIN, POST HEADER	J302
211505	CONNECTOR, 5 PIN, POST HDR, FRICTION LOCK	J301
470026	RESISTOR, 150 OHM, 1/4W, ±10%	R15
472005	RESISTOR, 249 OHM, 1/4W, ±1%	R11
472016	RESISTOR, 2.21k OHM, 1/4W, ±1%	R16
472022	RESISTOR, 4.99k OHM, 1/4W, ±1%	R12
472030	RESISTOR, 10k OHM, 1/4W, ±1%	R10
472049	RESISTOR, 49.9k OHM, 1/4W, ±1%	R4
472058	RESISTOR, 100k OHM, 1/4W, ±1%	R5, R7, R9
472065	RESISTOR, 200k OHM, 1/4W, ±1%	R1
472109	RESISTOR, 37.4k OHM, 1/4W, ±1%	R6
472146	RESISTOR, 47.5k OHM, 1/4W, ±1%	R8
472140	RESISTOR, 332k OHM, 1/4W, ±1%	R14
472185	RESISTOR, 61.9k OHM, 1/4W, ±1%	R13
472270	RESISTOR, 1.2M OHM, 1/4W, ±1%, METAL FILM	R2
474181	RESISTOR, 4.3 OHM, 1W, ±5%	R3
481022	DIODE, ZENER, BZYB8C12, 12V, 500mW	D2
481530	DIODE, KBU4D, BRIDGE RECTIFIER, 4 AMP	D1
481541	DIODE, UF4002, 100V, 1A, FAST RECOVERY	D5
481542	DIODE, UF5400, 50V, 3A, FAST RECOVERY	D3, D4
484529	VOLTAGE REGULATOR, LM78L05ACZ, 5V, 100mA	IC2
484539	VOLTAGE REGULATOR, LT1076CT, 2A, TO-220	IC1
485517	TRANSISTOR, VN10KM, N-CHANNEL FET	Q2
485527	MOSFET, IRF9523, .8 OHMS, 60V, P-CHANNEL	Q1
486716	IC, LM393N, DUAL COMPARATOR	IC3
515046	FUSE, 2 AMP, 250V, SLO-BLO	F301
515035	FUSE, 1/2 AMP, 250V, FAST-BLO	F302

NOTES:

1. FOR TEST PROCEDURE SEE A2472-04.
2. THE FOLLOWING COMPONENT IS NOT FITTED IN THIS ASSEMBLY: D6.

REV	R NO.	DATE
03	N403	9Aug96
02	N341	10JAN94
01	N316	31MAR93

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± .062 (mm) ± –
FRAC ± – (mm) ± –
HOLES +.007 –.003 (mm) (+.18 –.08)
ANG ± –
MATERIAL ——
FINISH ——

TITLE
POWER SUPPLY
BOARD ASSY,
OXYPLETH – 520A

DRAWN	CHECKED
MRL 13FEB92	AJE 4/2/92
MFG ENGR	APPROVED
EH 5-15-92	AEK 15-MAY-92

USED ON: D5873-01

NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
D	2472	01	03

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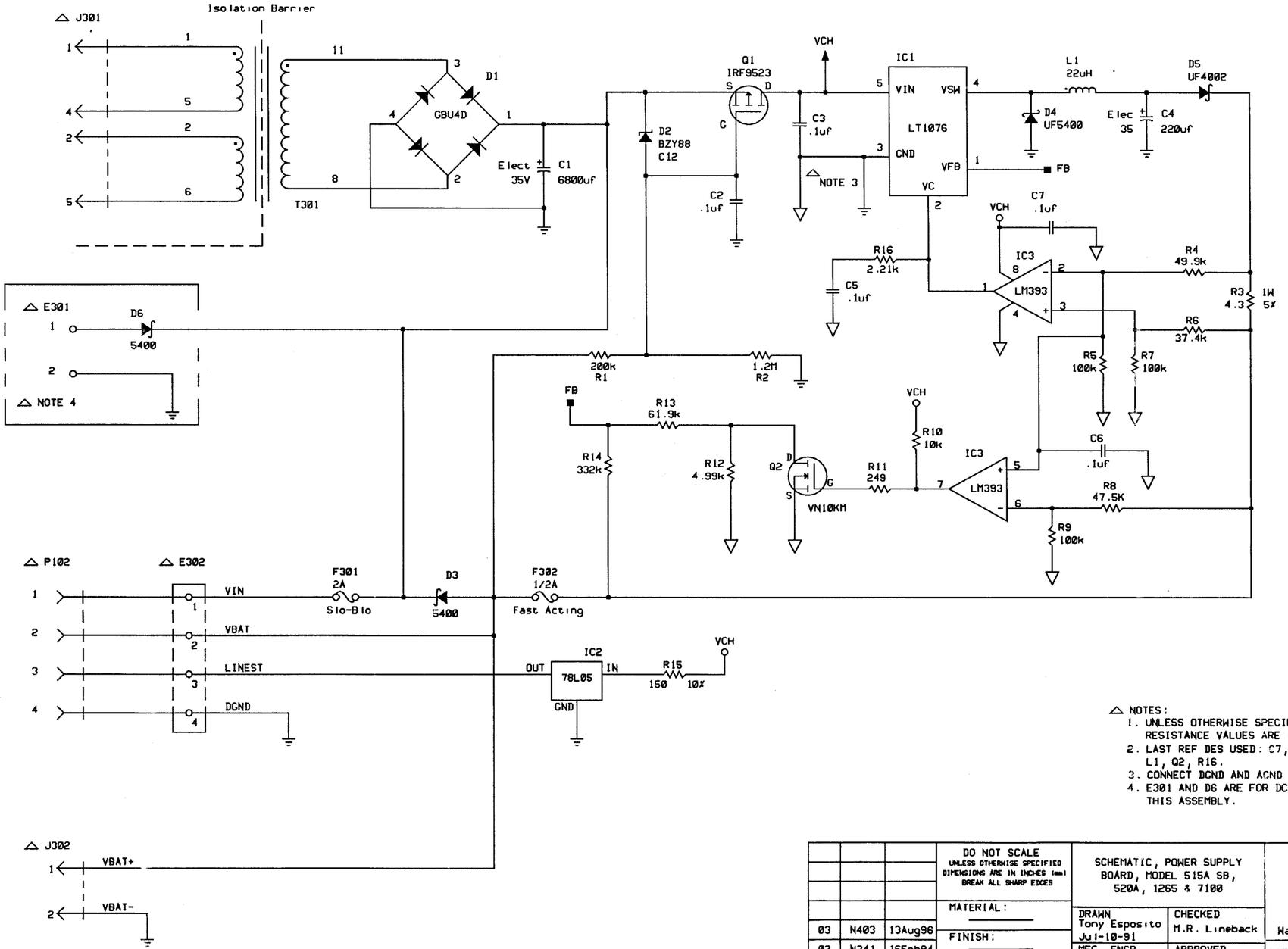

△ NOTES:
1. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS, 1/4W, 1%.
2. LAST REF DES USED: C7,D6, E302, F302, IC3, J302, L1, Q2, R16.
3. CONNECT DGND AND AGND ONLY AT IC1-3.
4. E301 AND D6 ARE FOR DC OPTION AND ARE NOT PART OF THIS ASSEMBLY.

REV.	"R" NO.	BY DATE
03	N403	13Aug96
02	N341	16Feb94
01	N316	1Apr93

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm) BREAK ALL SHARP EDGES

MATERIAL:

FINISH:

FILE: 24720303
DATE: 13-Aug-96
TIME: 11:04:27

SCHEMATIC, POWER SUPPLY BOARD, MODEL 515A SB, 520A, 1265 & 7100

DRAWN	CHECKED
Tony Esposito Jul-10-91	M.R. Lineback
MFG. ENGR Ed Harvie 5-15-92	APPROVED A.E. Kersey 15-May-92

USED ON D2472-01

NOVAMETRIX
Medical Systems, Inc.
Wallingford, CT USA 06492

SIZE	DWG NO.	CODE	REV.
D	2472	03	03

SCALE: NONE

SHEET 1 OF 1

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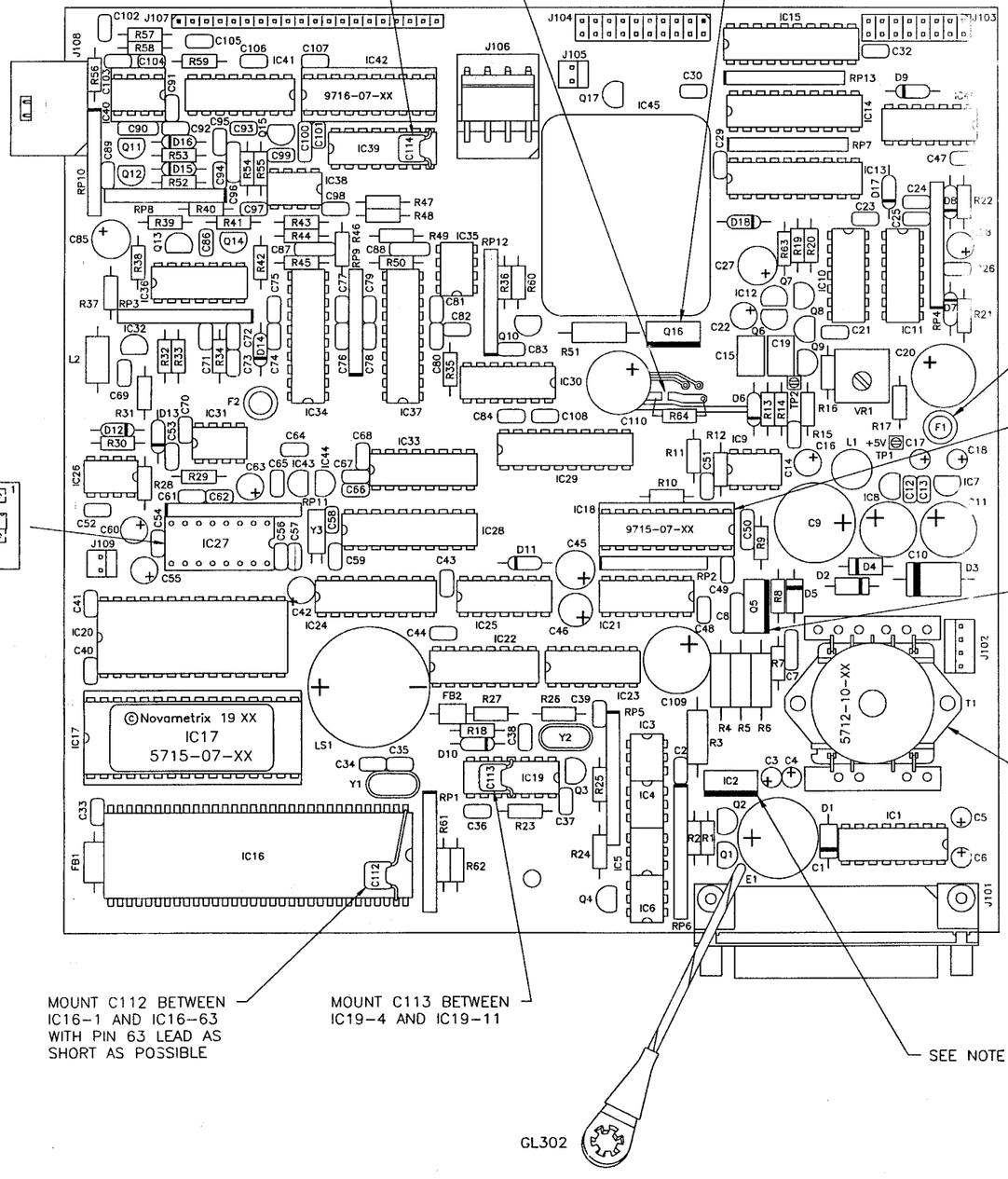
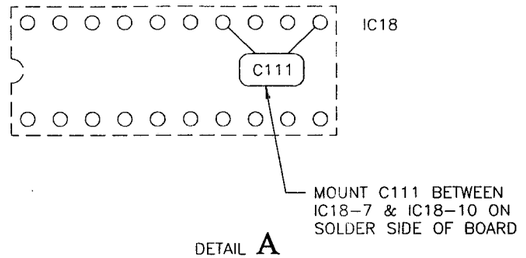
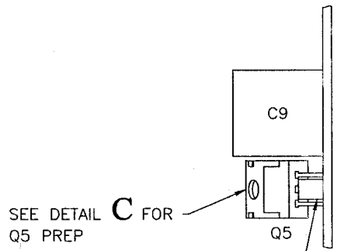

SCRAPE OFF SOLDERMASK & CUT CONDUCTOR. MOUNT R64 ACROSS BREAK APPROX AS SHOWN.
MOUNT C114 BETWEEN IC39-8 AND IC39-9
SEE NOTE 3
FUSEHOLDER F1 & F2
SEE DETAIL A FOR SOLDER SIDE MODIFICATIONS
SEE DETAIL B FOR Q5 SUBASSEMBLY
SEE NOTE 4
SEE NOTE 3
2755 BOARD SEE NOTE 6
MOUNT C112 BETWEEN IC16-1 AND IC16-63 WITH PIN 63 LEAD AS SHORT AS POSSIBLE
MOUNT C113 BETWEEN IC19-4 AND IC19-11
GL302
©Novametrix 19 XX
IC17
5715-07-XX
9716-07-XX
9715-07-XX
5712-10-XX

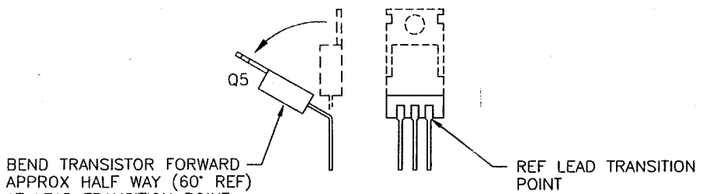


DETAIL A

SCALE: NONE



DETAIL B



DETAIL C

NOTES:

1. THE FOLLOWING COMPONENTS ARE NOT FITTED TO THIS ASSEMBLY: LS1.
2. FOR TEST PROCEDURE SEE A2471-04.
3. ENSURE THAT IC2 AND Q16 ARE NO HIGHER THAN C9 WHEN INSTALLED.
4. HAND SOLDER TRANSFORMER T1. DO NOT WAVE SOLDER.
5. FOR ATE TEST USE A6344-07, A6266-57 & A6266-04.
6. LOCATE 2755 BOARD AT IC27 WITH ORIENTATION AS SHOWN.

REV	R NO.	BY DATE
11	N681	13Aug99
10	N557	3Jun98
09	N557	26May98
08	N510	19Sep97
07	N403	25Jul96
06	N362	22Mar95
05	N348	5May94
04	N325	8Jul93
03	N316	31Mar93
02	N304	4Sep92
01	N302	28May92

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± —— (mm) ——
FRAC ± —— (mm) ——
HOLES +.007 -.003 (mm) (+.18 -.08)
ANG ± ——
MATERIAL ——
FINISH ——

TITLE
MAIN BOARD ASSY, OXYPLETH - 520A

NOVAMETRIX MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

DRAWN	CHECKED
MRL 10FEB92	AE 29APR92
MFG ENGR EH 29APR92	APPROVED AK 29APR92

USED ON: D5693-01

SIZE	DRAWING NO.	CODE	REV
D	2471	01	11

SCALE: 2/1 SHEET 1 OF 2

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PN	DESCRIPTION	REF DES
2471-02	FAB, MAIN BOARD, MODEL 520A & 515A SB	~
D2471-03	SCHEMATIC, MAIN BOARD, MODEL 520A	~
A2471-04	TEST PROCEDURE, MAIN BOARD, MODEL 520A	~
A2471-28	MAIN BOARD KIT, MODEL 520A	SEE COMPONENT CHART
C2755-01	TONE GENERATOR REPLACEMENT BOARD ASSY	(FOR IC27)
C5711-10	TRANSFORMER, MAIN BOARD	T1 ALTERNATE
C5712-10	TRANSFORMER, MAIN BOARD	T1
A5715-07	PROGRAM, EPROM ASSY, SaO2	IC17
B5833-01	GROUND WIRE ASSY, MAIN BOARD, OXYPLETH	(FOR GL302)
A6266-04	TEST PROCEDURE, ATE FOR 2471 & 2474	~
A6266-57	PROGRAM, DISK ASSY, FOR 2471 & 2474 ATE	~
B6328-14	ATE FIXTURE, 2471 & 2474 ASSEMBLIES	~
B6332-01	SAO2 TEST JACK ASSY, ATE TEST	~
A6344-07	PROGRAM, EPROM ASSY, FOR 2471 & 2474 ATE	(FOR IC17)
☆A9715-07	PROGRAM, PEEL ASSY, CSIO CONTROLLER	IC18
☆A9716-07	PROGRAM, PEEL ASSY, TIMING SEQUENCER	IC42
152040	CAPACITOR, 2.2uF, 35V, TANTALUM	C22, C28, C42
152045	CAPACITOR, 10uF, 16V, .2 SPACING	C3-C6, C17, C18
☆152066	CAP, 220uF, 63V, RADIAL, ELECTROLYTIC	C109
152072	CAP, 10uF, 50V, 20%, AL, ELECTROLYTIC	C45
152073	CAP, 100uF, 16V, 20%, AL, ELECTROLYTIC	C46, C55, C63, C85
152075	CAP, 47uF, 25V, 20%, AL, ELECTROLYTIC	C27, C60
☆152084	CAP, 470uF, 25V, 20%, AL, ELECTROLYTIC	C10, C11
☆152085	CAP, 1200uF, 25V, 20%, AL, ELECTROLYTIC	C1, C9
☆152086	CAP, 1000uF, 16V, 20%, AL, ELECTROLYTIC	C20, C110
153003	CAPACITOR, .01uF, 50V, .1 SPACING	C62
☆153006	CAPACITOR, 47pF, 63V, +80% TO -20%, .1 SP	C94, C95, C103, C104
☆153012	CAPACITOR, 22pF, 100V, 2%, MTLZD CERAMIC	C34, C35, C57, C59
☆153013	CAPACITOR, 33pF, 100V, 2%, MTLZD CERAMIC	C38, C39, C51
153021	CAPACITOR, .47uF, MULTILAYER CERAMIC	C16
153027	CAPACITOR, 220pF, 50V, 10%, .1 SP, RADIAL	C111
153038	CAPACITOR, .001uF, 50V, 5%, .1 SPACING	C36
☆153046	CAPACITOR, 4700pF, 100V, 10%, CERAMIC PL	C72
153051	CAPACITOR, .22uF, 50V, 20%, MLTLYR CERAMIC	C53
153052	CAPACITOR, .022uF, 50V, .1 SPACING	C54
153062	CAPACITOR, 150pF, 100V, 5%, .2 SP, RADIAL	C112-C114
154016	CAPACITOR, .1uF, 50V, .1 SP, DIPPED RADIAL	C2, C12-C14, C21, C23 C24-C26, C29, C30, C32, C33, C37, C40, C41, C43, C44, C47-C49, C52, C56, C58, C61, C64-C71, C73, C74-C84, C86, C89, C91, C92, C93, C97-C99, C101, C102, C105-C108
☆154057	CAPACITOR, 470pF, 100V, 10%, POLYCARB	C50
154058	CAPACITOR, .022uF, 63V, 10%, MTLZD POLY	C8
154060	CAPACITOR, .22uF, 63V, 10%, MTLZD POLY	C7
154065	CAPACITOR, .1uF, 63V, .2 SP, POLYESTER FILM	C87, C88, C90, C96, C100
☆154076	CAPACITOR, .01uF, 63V, 1%, POLYPROPYLENE	C15, C19

PN	DESCRIPTION	REF DES
☆180004	CHOKE, 100uH, ±10%, SHIELDED	L2
☆180010	INDUCTOR, 18uH, ±10%, .2 SP	L1
☆180011	FERRITE BEAD, 22AWG THRU CORE, 1 TURN	FB1
☆180012	FERRITE BEAD	FB2, FB3
☆210051	CONNECTOR, 25 PIN, RECEPTACLE, R ANGLE	J101
☆210097	CONNECTOR, 16 PIN, HEADER, DIL, STRAIGHT	J103
☆211213	CONNECTOR, 2 PIN, MALE HEADER	J105, J109
☆211412	CONNECTOR, 4 PIN, HEADER, R ANGLE	J106
☆211414	CONNECTOR, 4 PIN, PLUG, FRICTION LOCK	J102
☆211629	CONNECTOR, 6 PIN, PLUG, SIL, R ANGLE	J108
☆212501	CONNECTOR, 20 PIN, I/O HEADER	J104
☆212529	CONNECTOR, 20 PIN, HEADER, STRAIGHT	J107
☆215031	SOCKET, IC, 20 PIN, LOW PROFILE	(FOR IC42, IC18)
☆215055	SOCKET, IC, 8 PIN DIL, .3 DIP SP, OPEN FRAME	(FOR IC40)
☆215060	SOCKET, IC, 32 PIN, DIP, .6 SPACING	(FOR IC17)
216029	TEST POINT	TP1, TP2
☆230005	CRYSTAL, 3.2768M Hz	Y2
☆230016	CRYSTAL, 32.768k Hz	Y3
☆230018	CRYSTAL, 12.288M Hz	Y1

PN	DESCRIPTION	REF DES
☆400035	IC, DC TO AC INVERTER, 5VDC INPUT	IC45
470010	RESISTOR, 22 OHM, 1/4W, 10%	R11
☆470011	RESISTOR, .33 OHM, 1/2W, 10%, METAL FILM	R4-R6
☆471[illegible]	RESISTOR, 100M OHM, 1W, 5%	R3
472005	RESISTOR, 100 OHM, 1/4W, 1%	R18, R27, R59, R63
472006	RESISTOR, 475 OHM, 1/4W, 1%	R1, R2, R7, R20, R24, R25
472011	RESISTOR, 1k OHM, 1/4W, 1%	R8, R9, R15, R26, R34
472024	RESISTOR, 4.75k OHM, 1/4W, 1%	R16
472030	RESISTOR, 10k OHM, 1/4W, 1%	R22, R29, R30, R60-R62
472031	RESISTOR, 12.1k OHM, 1/4W, 1%	R19
472033	RESISTOR, 13.7k OHM, 1/4W, 1%	R45, R50
472041	RESISTOR, 20k OHM, 1/4W, 1%	R37, R38
472058	RESISTOR, 100k OHM, 1/4W, 1%	R12, R33, R43, R44, R56-R58
472063	RESISTOR, 162k OHM, 1/4W, 1%	R32
472082	RESISTOR, 3.92k OHM, 1/4W, 1%	R54, R55
472121	RESISTOR, 3.74k OHM, 1/4W, 1%	R17
472150	RESISTOR, 47.5k OHM, 1/4W, 1%	R21
472170	RESISTOR, 22.1k OHM, 1/4W, 1%	R10
472193	RESISTOR, 23.7k OHM, 1/4W, 1%	R36
472197	RESISTOR, 41.2k OHM, 1/4W, 1%	R46-R49
472198	RESISTOR, 3.3 OHM, 1/4W, 1%	R53
472200	RESISTOR, 5.6 OHM, 1/4W, 1%	R52
472227	RESISTOR, 47 OHM, 1/4W, 1%, METAL FILM	R14, R35
472256	RESISTOR, 66.5k OHM, 1/4W, 1%, METAL FILM	R40, R42
472261	RESISTOR, 1 OHM, 1/4W, 1%, METAL FILM	R28, R64
472266	RESISTOR, 8.66k OHM, 1/4W, 1%, METAL FILM	R13
472272	RESISTOR, 59k OHM, 1/4W, 1%	R23
472274	RESISTOR, 26.7 OHM, 1/4W, 1%	R31
472276	RESISTOR, 6.49k OHM, 1/4W, 1%	R39, R41
474032	RESISTOR, 10 OHM, 1/2W, 5%	R51
474080	RESISTOR PACK, 10k OHM, 2%, 8 BUS RES	RP1
474089	RESISTOR PACK, 100k OHM, 2%, 8 BUS RES	RP7, RP13
474095	RESISTOR PACK, 100k OHM, 2%, 5 ISOL RES	RP3-RP6
474131	RESISTOR PACK, 10k OHM, 2%, 5 BUS RES	RP2
474132	RESISTOR PACK, 41k OHM, 2%, 4 ISOL RES	RP10, RP12
474133	RESISTOR PACK, 10 OHM, 2%, 4 ISOL RES	RP9
474134	RESISTOR PACK, 41k OHM, 2%, 8 BUS RES	RP8
474135	RESISTOR PACK, 100 OHM, 2%, 5 ISOL RES	RP11
475034	POTENTIOMETER, 2k OHM, 10%, 1 T, TOP ADJ	VR1

PN	DESCRIPTION	REF DES
481031	DIODE, ZENER, BZX79-C7V5, 7.5V, 500mW	D12
481501	DIODE, 1N4148, SILICON	D6-D11, D14-D16, D18
481534	DIODE, SCHOTTKY, BAT82, MINIATURE, DO-34	D13, D17
481541	DIODE, UF4002, 100V, 1A, FAST RECOVERY	D1, D2, D4, D5
☆481542	DIODE, UF5400, 50V, 3A, FAST RECOVERY	D3
483002	TRANSISTOR, 2N3906, PNP, SILICON	Q10
483017	TRANSISTOR, BC214C, PNP, SILICON	Q1-Q4
☆484014	TRANSISTOR, ZTX109C, NPN	Q9
☆484515	VOLTAGE REGULATOR, LM317LZ, POSITIVE, ADJ	IC32
☆484523	VOLTAGE REGULATOR, LM79L05ACZ, 100mA, NEG	IC43
☆484529	VOLTAGE REGULATOR, LM78L05ACZ, +5V, 100mA	IC44
☆484531	VOLTAGE REGULATOR, 78M05CKC, +5V, 500mA	IC2
☆484533	VOLTAGE REGULATOR, LP2950ACZ-5.0, ADJ	IC12
☆484534	VOLTAGE REGULATOR, LM79L12ACZ, -12V DC	IC8
☆484535	VOLTAGE REGULATOR, LM78L12ACZ, +12V DC	IC7
☆485520	TRANSISTOR, MOSFET, BS250, P-CHANNEL	Q6, Q8
☆485527	TRANSISTOR, MOSFET, IRF9523, 60V, P-CHANNEL	Q16
☆485528	TRANSISTOR, MOSFET, IRF540, 100V, N-CHANNEL	Q5
☆485529	TRANSISTOR, VN0610L, N-CHAN ENHANCEMENT	Q7, Q11-Q15, Q17
☆486256	IC, HM62256LP-12, 32k STATIC RAM	IC20
☆486268	IC, DG444DJ, SPST CMOS ANALOG SW, 4 CHAN	IC41
☆486276	IC, DS232CPE, DUAL RS232C RCVR/XMITTER	IC1
☆486285	IC, HID64180R1P6, 8 BIT MPU, HI INTEGRATION	IC16
☆486295	IC, MM74HC4051N, 8-CHAN ANALOG MULTIPLXR	IC33
☆486298	IC, MM74HC4020N, 14-STAGE BINARY COUNTER	IC39
486299	IC, CS5503-JD-EP, 20-BIT A TO D CONVERTER	IC34, IC37
☆485300	IC, TLC549IP, 8-BIT CONVERTER, SERIAL CNTRL	IC31
☆486305	IC, MSM6242BRS, REAL TIME CLOCK/CALENDAR	IC24
☆486600	IC, CD4013B, DUAL D-TYPE FLIP FLOP	IC10
☆486606	IC, CD4093BE, QUAD 2 INPUT NAND GATE	IC11
☆486625	IC, MC74HC32N, QUAD 2 INPUT OR GATE	IC23, IC25, IC46
☆486651	IC, MM74HC138, 3 TO 8 LINE DECODER	IC22
☆486675	IC, MM74HC14N, CMOS	IC19, IC21
☆486680	IC, MM74HC573N, CMOS	IC13-IC15, IC28
☆486685	IC, AD7528JN, CMOS INTERFACE	IC29
☆486712	IC, TL074CN, QUAD F FET, LOW OFFSET	IC30, IC36
☆487053	IC, AD712JN, DUAL BIFET OP AMPLIFIER	IC38, IC40
☆487061	IC, TBA820M, MONOLITHIC INT AUDIO AMP, 2W	IC26
487064	IC, CNY17-III, PHOTON COUPLED ISOLATOR	IC3-IC6
☆487065	IC, UC3843N, CURRENT MODE PWM CONTROLLER	IC9
☆487069	IC, LT1019CN8-2.5, 16V VOLTAGE REFERENCE	IC35
☆515071	FUSE, 1/10A, 125V, FAST-ACTING, PLUG-IN	F2
☆515072	FUSE, 1A, 125V, FAST-ACTING, PLUG-IN	F1
☆515511	FUSEHOLDER, VERT, 5A, 125V, SILVER PLD	(FOR F1, F2)

☆ DENOTES COMPONENTS COMPRISING A2471-28 KIT

REV	R NO.	BY DATE
11	N681	13Aug99
10	N557	3Jun98
09	N557	26May98
08	N510	19Sep97
07	N403	25Jul96
06	N362	22Mar95
05	N348	4May94
04	N325	8Jul93
03	N316	31MAR93
02	N304	4SEPT92
01	N302	28MAY92

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ——— (mm) ———
FRAC ± ——— (mm) ———
HOLE +.007 -.003 (+.18 -.08)
ANG ± ———
MATERIAL ———
FINISH ———

TITLE: MAIN BOARD ASSY, OXYPLETH - 520A

DRAWN MRL 30JAN92	CHECKED AE 24APR92
MFG ENGR EH 29APR92	APPROVED AK 29APR92

USED ON: 05693-01

NOVAMETRIX MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
D	2471	01	11

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IC CHART

REF DES	TYPE NO.	POWER														DEDCOUPLING CAP (.1uF)
		VCC	VCCI	VBACK	V IN	+VI	+V5	+V12	+VA	-V5	-V12	-VA	A GND	D GND	I GND	
IC1	DS232CPE	–	16	–	–	–	–	–	–	–	–	–	–	–	15	C2 TO I GND
IC2	78M05CKC	–	OUT	–	–	IN	–	–	–	–	–	–	–	–	GND	NONE
IC3	CNY17-III	–	–	–	–	–	–	–	–	–	–	–	–	–	–	NONE
IC4	CNY17-III	–	–	–	–	–	–	–	–	–	–	–	–	–	–	NONE
IC5	CNY17-III	–	–	–	–	–	–	–	–	–	–	–	–	–	–	NONE
IC6	CNY17-III	–	–	–	–	–	–	–	–	–	–	–	–	–	–	NONE
IC7	LM78L12ACZ	–	–	–	–	–	–	OUT	IN	–	–	–	GND	–	–	C13 TO A GND
IC8	LM79L12ACZ	–	–	–	–	–	–	–	–	–	OUT	IN	GND	–	–	C12 TO A GND
IC9	UC3843N	–	–	–	7 (4)	–	–	–	–	–	–	–	–	5	–	C16 TO D GND (.47uF)
IC10	CD4013B	–	–	14	–	–	–	–	–	–	–	–	–	7	–	C23 TO D GND
IC11	CD4093BE	–	–	14	–	–	–	–	–	–	–	–	–	7	–	C25 TO D GND
IC12	LP2950ACZ	–	–	OUT	IN	–	–	–	–	–	–	–	–	GND	–	C22 TO D GND (2.2uF)
IC13	MM74HC573N	20	–	–	–	–	–	–	–	–	–	–	–	10	–	C29 TO D GND
IC14	MM74HC573N	20	–	–	–	–	–	–	–	–	–	–	–	10	–	C30 TO D GND
IC15	MM74HC573N	20	–	–	–	–	–	–	–	–	–	–	–	10	–	NONE
IC16	HID641B0R1P6	33	–	–	–	–	–	–	–	–	–	–	–	1, 33	–	C33 TO D GND
IC17 (1)	HN27C101G-17	32	–	–	–	–	–	–	–	–	–	–	–	16	–	C40 TO D GND
IC18 (2)	PEEL18CV8	20	–	–	–	–	–	–	–	–	–	–	–	10	–	C49 TO D GND
IC19	MM74HC14N	14	–	–	–	–	–	–	–	–	–	–	–	7	–	C37 TO D GND
IC20	HM62256LP-12	–	–	28	–	–	–	–	–	–	–	–	–	14	–	C41 TO D GND
IC21	MM74HC14N	14	–	–	–	–	–	–	–	–	–	–	–	7	–	C48 TO D GND
IC22	MM74HC138	16	–	–	–	–	–	–	–	–	–	–	–	8	–	C44 TO D GND
IC23	MC74HC32N	14	–	–	–	–	–	–	–	–	–	–	–	7	–	NONE
IC24	MSM6242BRS	–	–	18	–	–	–	–	–	–	–	–	–	9	–	C42 TO D GND (2.2uF)
IC25	MC74HC32N	–	–	14	–	–	–	–	–	–	–	–	–	7	–	C43 TO D GND
IC26	TBA820M	6	–	–	–	–	–	–	–	–	–	–	–	4	–	C52 TO D GND
IC27	SN76496AN	16	–	–	–	–	–	–	–	–	–	–	–	8	–	C56 TO D GND
IC28	MM74HC573N	20	–	–	–	–	–	–	–	–	–	–	–	10	–	C58 TO D GND
IC29	AD7528JN	17	–	–	–	–	–	–	–	–	–	–	1	5	–	C108 TO D GND
IC30	TL074CN	–	–	–	–	–	–	4	–	–	11	–	–	–	–	C83 TO A GND C84 TO A GND
IC31	TLC5491P	–	–	–	–	–	8	–	–	–	–	–	4	–	–	C70 TO A GND
IC32	LM317LZ	–	–	–	–	–	–	–	IN	–	–	–	–	–	–	NONE
IC33	MM74HC4051N	16	–	–	–	–	–	–	–	7	–		–	3	–	C68 TO D GND
IC34	CS5503JP	–	–	–	–	–	14 15 (4)	–	–	 6 (4) 7	–	–	8	5	–	C75 TO D GND C74 TO D GND C76 TO D GND C77 TO D GND
IC35	LT1019CN8-2.5	–	–	–	–	–	–	2 (4)	–	–	–	–	4	–	–	C82 TO A GND
IC36	TL074CN	–	–	–	–	–	–	4	–	–	11	–	–	–	–	C71 TO A GND C86 TO A GND
IC37	CS5503JP	–	–	–	–	–	14 15 (4)	–	–	 6 (4) 7	–	–	8	5	–	C79 TO D GND C78 TO D GND C80 TO D GND C81 TO D GND
IC38	AD712JN	–	–	–	–	–	–	8	–	–	4	–	–	–	–	C98 TO A GND C99 TO A GND
IC39	MM74HC4020N	16	–	–	–	–	–	–	–	–	–	–	–	8	–	C101 TO D GND
IC40	TLE2022CP	–	–	–	–	–	–	8	–	–	4	–	–	–	–	C91 C102
IC41	DG444DJ	12	–	–	–	–	–	13	–	–	4	–	5	–	–	C93 TO A GND C106 TO A GND
IC42 (3)	PEEL18CV8	20	–	–	–	–	–	–	–	–	–	–	–	10	–	C107 TO D GND
IC43	LM79L05ACZ	–	–	–	–	–	–	–	–	OUT	–	IN	GND	–	–	C65 TO A GND
IC44	LM78L05ACZ	–	–	–	–	–	OUT	–	IN	–	–	–	GND	–	–	C66 TO A GND
IC45	E1166	1	–	–	–	–	–	–	–	–	–	–	2	–	–	C110 TO A GND (1000uF)
IC46	MC74HC32N	14	–	–	–	–	–	–	–	–	–	–	–	7	–	C47 TO D GND

NOTES:

(1) IC17 IS PART OF Sa02 PROGRAM.

(2) IC18 IS PART OF CSIO CONTROLLER PROGRAM.

(3) IC42 IS PART OF TIMING SEQUENCER PROGRAM.

(4) POWER IS INDIRECTLY CONNECTED THROUGH ADDITIONAL COMPONENTS.

5. UNLESS OTHERWISE SPECIFIED:
   RESISTOR VALUES ARE IN OHMS, 1/4W, ±1%

6. LAST REFERENCE DESIGNATOR USED: C114, D18, F2, FB3, IC46, J109, L2, Q17, R64, RP13, T1, TP2, VR1, Y3

7. REFERENCE DESIGNATOR NOT USED: J103, LS1

8. TONE GENERATOR BOARD 2755-01 FITTED IN PLACE OF IC27.

REV	R NO.	BY DATE
11	N681	12Aug99
10	N557	3Jun98
09	N557	28May98
08	N510	19Sep97

REV	R NO.	DATE
07	N403	6Aug96
06	N362	23Mar95
05	N348	5May94
04	N325	23Jul93
03	N316	31MAR93
02	N304	4SEPT92
01	N302	2JUN92

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ——— (mm) ———
FRAC ± ——— (mm) ———
HOLES +.007 -.001 (mm) (+.18 -.08)
ANG ± ———
MATERIAL ———
FINISH ———

TITLE
SCHEMATIC,
MAIN BOARD,
MODEL 520A

USED ON D2471-01

DRAWN MRL 30APR92 | CHECKED AE 2APR92
MFG ENGR EH 29APR92 | APPROVED AK 29APR92

NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
D	2471	03	11

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DATA BUS

ADDRESS BUS

CONTROL BUS

To Sheets 2,3 and 4

8-bit Micro Computer

D TRANS LATCHES

REV.	"R" NO.	BY DATE
11	N681	12Aug99
10	N557	3Jun98
09	N557	27May98
08	N510	26Sep97
07	N403	13Aug96
06	N362	5Apr95
05	N238	13Sep94

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES

MATERIAL:

FINISH:

FILE: 24710311b
DATE: 12-Aug-99
TIME: 15:40:55

SCHEMATIC, MAIN BOARD, OXYPLETH - 520A

DRAWN	CHECKED
Tony Esposito Jan-30-1991	M.R. Lineback 15May92
MFG. ENGR Ed Harvie 5-15-92	APPROVED A.E. Kersey 15-May-92

USED ON D2471-01

NOVAMETRIX
Medical Systems, Inc.
Wallingford, CT USA 06492

SIZE	DWG NO.	CODE	REV.
D	2471	03	11

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CONTROL BUS

To Sheets 1, 3 and 4

+V12 R35 47 C82 .1uf LT1019CN8-2.5 IC35 2.5VREF

IC44 78L05 +VA C66 .1uf C67 .1uf +V5

C65 .1uf C64 .1uf -V5 -V12 IC43 79L05

2.5VREF CSADC1* SDATA CLKS SC2 CAL SC1 CLKSEQ

IC37 CS5503 C79 .1uf C78 .1uf C89 .1uf C81 .1uf C80 .1uf RP9 10

IC34 CS5503 C75 .1uf C74 .1uf C87 .1uf C77 .1uf C76 .1uf RP9 10

CSADC2* 2.5VREF

C70 .1uf CSADC3* SDATA CLKS

IC31 TLC549I /CS VCC DOUT CLK AIN REF- GND REF+ R29 10k D13 BAT82

IC33 8CHAN ANALOG MUX/DMUX HC4051 C68 .1uf A0AUX A1AUX A2AUX ADCV12 ADCAUX1 FE DC LEDPWR INC PRB IRLED BAT RDLED

+V12 RP3 100k RP8 41.0k

IC39 14-BIT BIN COUNTER RESET CLKSEQ 0 Q1 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14

IC42 18CV8 PEEL CLK D0 D1 D2 D3 D4 D5 D6 SC1 SC2 I/O 19 INSIG* 18 RDLED* 17 IRLED* 16 SIGND* 15 ASAMP* 14 SYNC 13 ISMP* 12 RDSMP* 11 SC2

C114 150pF AUD CLK INTSMS SC1 SC2 SYNC

4VREF VBAT RP3 100k

IC36 TLO74 2.5VREF R33 100k R32 162k

R42 66.5k C72 .0047uf RP3 100k R34 1k D14 4148 C73 .1uf RP10 41.0k RP8 41.0k IC36 TLO74

R49 41.2k R50 13.7k IC38 AD712JN R43 100k R48 41.2k R55 3.92k C96 .1uf IC41 DG444

R46 41.2k R45 13.7k IC38 AD712JN R44 100k R47 41.2k R54 3.92k C100 .1uf IC41 DG444

VLED R37 20k R38 20k

Q15 VN0610L R56 100k IC41 DG444

C90 .1uf R59 100 IC40 AD712JN

C104 47pf R58 100k J108 DET1 DET2 C103 47pf R57 100k

R40 66.5k RP8 41.0k C97 .1uf AGND

Q14 VN0610L R41 6.49k IC36 TLO74 D16 1N4148 C95 47pf R53 3.3 1/4W

Q11 VN0610L LEDISK RP10 41.0k RP8 41.0k C92 .1uf

Q13 VN0610L R39 6.49k IC36 TLO74 D15 1N4148 C94 47pf R52 5.6 1/4W

Q12 VN0610L LED2SK RP10 41.0k RP8 41.0k C89 .1uf

+VA F2 100ma IC32 LM317LZ R31 26.7 1/4W L2 100uH D12 BZX79 C7V5 C69 .1uf ALUM C85 100uf 10V

LEDSRC RP10 41.0k RP8 41.0k

REV.	"R" NO.	BY DATE
11	N681	12Aug99
10	N557	3Jun98
09	N557	27May98
08	N510	26Sep97
07	N403	13Aug96
06	N362	5Apr95
05	N348	13Sep94

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [mm] BREAK ALL SHARP EDGES

MATERIAL:

FINISH:

FILE: 24710311c
DATE: 17-Aug-99
TIME: 11:51:08

SCHEMATIC, MAIN BOARD, OXYPLETH - 520A

DRAWN	CHECKED
Tony Esposito Jan-30-92	M.R. Lineback 15May92
MFG. ENGR Ed Harvie 5-15-92	APPROVED A.E. Kersey 15-May-92

USED ON D2471-01

NOVAMETRIX
Medical Systems, Inc.
Wallingford, CT USA 06492

SIZE	DWG NO.	CODE	REV.
D	2471	03	11

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DATA BUS

ADDRESS BUS

CONTROL BUS

To Sheets 1, 2 and 4

IC24 MSM6242 — Real-Time CLK

IC27 SEE NOTE 8 — Tone Controller

IC29 — IC30 — IC13 74HC573 — D TRANS LATCHES

IC14 74HC573 — D TRANS LATCHES

IC15 74HC573 — D TRANS LATCHES

IC19 74HC14

IC45 E1166

Q16 IRF9523

Q17 VN0610L

Q10 2N3906

D9 1N4148

D10 1N4148

LS1

Y3 32.768KHz

TBA820M

TL074

RP2 10k

RP7 100k

RP11 100

RP12 41.0k

RP13 100k

VBACK

TANT C42 2.2uF 35V

C59 22pF

C57 22pF

C56 0.1uF

C52 0.1uF

C61 .1uF

C62 .01uF

C63 100uF 6.3V ALUM

C60 47uF 10V ALUM

C55 100uF 6.3V ALUM

C54 .022uF

C53 .22uF

C108 .1uf

C83 .1uF

C84 .1uF

C29 .1uF

C30 .1uF

C36 .001uF

C110 1000uF 16V ALUM

R23 59k

R18 100

R28 1

R30 10k

R36 23.7k

R60 10k

R51 10 1/2W

R64 1

+V12

-V12

-12V

VCC

4VREF

VLED

CNTRST

SNDOUT

KJL*

CAL

TML*

AOL*

ARL*

BTL*

DSPBR

OFFDIS

LINEST

ON/OFF

S2 S3 S4 S5 S6 S7 S8 S9/PROBUS S10 S11 (SPARE) S12 (SPARE)

SWGND RGND LGND

J104 J105 J106 J109

AUD_CLK WAIT* DREQ* WR* AUD* RD* WR* RTCCS* CS0* RDKEY* RDKEY_2* LPORT DACCS* A0 A1 A2 A3 D0 D1 D2 D3 D4 D5 D6 D7

AUDIO OUT AUDIO IN CCD+ CCD-

△ This supply connects back to switcher +5V.

△ This point connects back to switcher gnd.

REV.	"R" NO.	BY DATE
11	N681	12Aug99
10	N557	3Jun98
09	N557	27May98
08	N510	26Sep97
07	N403	13Aug96
06	N362	5Apr95
05	N348	13Sep94

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm) BREAK ALL SHARP EDGES

MATERIAL:

FINISH:

FILE: 24710311d
DATE: 12-Aug-99
TIME: 16:25:13

SCHEMATIC, MAIN BOARD, OXYPLETH - 520A

DRAWN	CHECKED
Tony Esposito Jan-20-1991	M.R. Lineback 22May92
MFG. ENGR Ed Harvie 5-22-92	APPROVED A.E. Kersey 22-May-92

USED ON D2471-01

NOVAMETRIX
Medical Systems, Inc.
Wallingford, CT USA 06492

SIZE	DWG NO.	CODE	REV.
D	2471	03	11

SCALE: NONE — SHEET 4 OF 5

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ISOLATION BARRIER

T1

IC7 78L12 +V12

IC8 79L12 -V12

+VA

VCC

TP1

F1 1A Slo-Blo

D2 UF4002

D4 UF4002

D3 UF5400

L1 18uH

D1 UF4002

IC2 78M05

J101 VRAWI GNDI VCCI TX1TTL

IC10 4013

IC11 4093

IC9 UC3843

IC3 CNY17 OPTOCOUPLER

IC4 CNY17 OPTOCOUPLER

IC5 CNY17 OPTOCOUPLER

IC6 CNY17 OPTOCOUPLER

IC1 MAX232CPE

J102 LINEST

DGND

VBAT

VIN

SYNC

ON\OFF

PWRON*

OFFDIS

CTS*

TX0

RX0

TX1

Q1 BC214C

Q2 BC214C

Q3 BC214C

Q4 BC214C

Q5 IRF540

Q6 BS250

Q7 VN0610L

Q8 BS250

Q9 ZTX109C

IC12 LP2950AC

D5 UF4002

D17 BAT82

D18 IN4148

FB3

SPARES

E1 GL302

REV.	"R" NO.	BY DATE
11	N681	12Aug99
10	N557	3Jun98
09	N557	27May98
08	N510	26Sep97
07	N403	13Aug96
06	N362	5Apr95
05	N348	13Sep94

DO NOT SCALE
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MATERIAL:

FINISH:

FILE: 2471031le
DATE: 12-Aug-99
TIME: 17:40:59

SCHEMATIC, MAIN BOARD, OXYPLETH - 520A

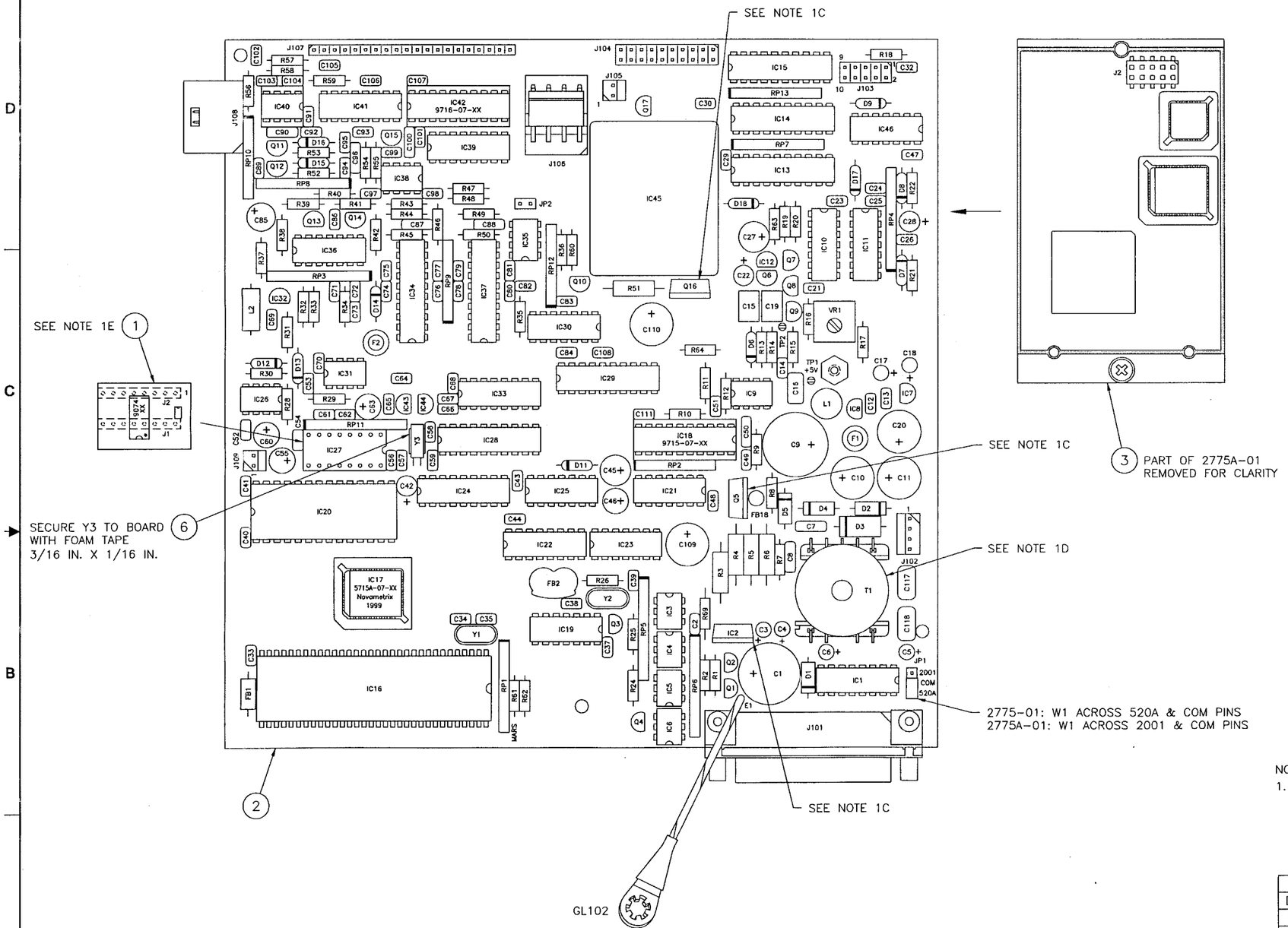
DRAWN	CHECKED
Tony Esposito Jan-30-1991	M.R. Lineback 22May92
MFG. ENGR Ed Harvie 5-22-92	APPROVED A.E. Kersey 22-May-92

USED ON D2471-01

NOVAMETRIX
Medical Systems, Inc.
Wallingford, CT USA 06492

SIZE	DWG NO.	CODE	REV.
D	2471	03	11

SCALE: NONE SHEET 5 OF 5



NOTES:

1. GENERAL SPECIFICATIONS:
   A. ASSEMBLY IS SHOWN FOR REFERENCE ONLY.
   B. FOR TEST PROCEDURE SEE A2775-04.
   C. WHEN MOUNTING IC2, Q5, AND Q16 ENSURE THAT THE HEIGHT IS NO HIGHER THAN C9.
   D. HAND SOLDER TRANSFORMER T1. DO NOT WAVE SOLDER.
   E. INSTALL 2755 BOARD AT IC27 WITH ORIENTATION AS SHOWN.

DRAWING TABULATION

DWG NO.	REV	TITLE	NEXT ASSY
D2775-01	04 N820	MAIN BOARD ASSEMBLY, 520A	D5693-01
D2775A-01	04 N820	MAIN BOARD ASSEMBLY, 2001	D9400-01

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REV	R NO.	DATE
04	N820	17Nov00
03	N804	110ct00
02	N745	5Apr00
01	N727	17Jan00

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [mm]
TOLERANCES
.XX ±.01 [.254]
.XXX ±.005 [.127]
.XXXX ±.0025 [.064]
FRAC ±1/64
ANG ±1/4°

	DATE
DRAWN B. Lancaster	29Jul99
CHECK MRL	80ct99
MFG ENGR T. Carroll	80ct99
ENGR ~	DATE
PROJ ENGR AJE	80ct99

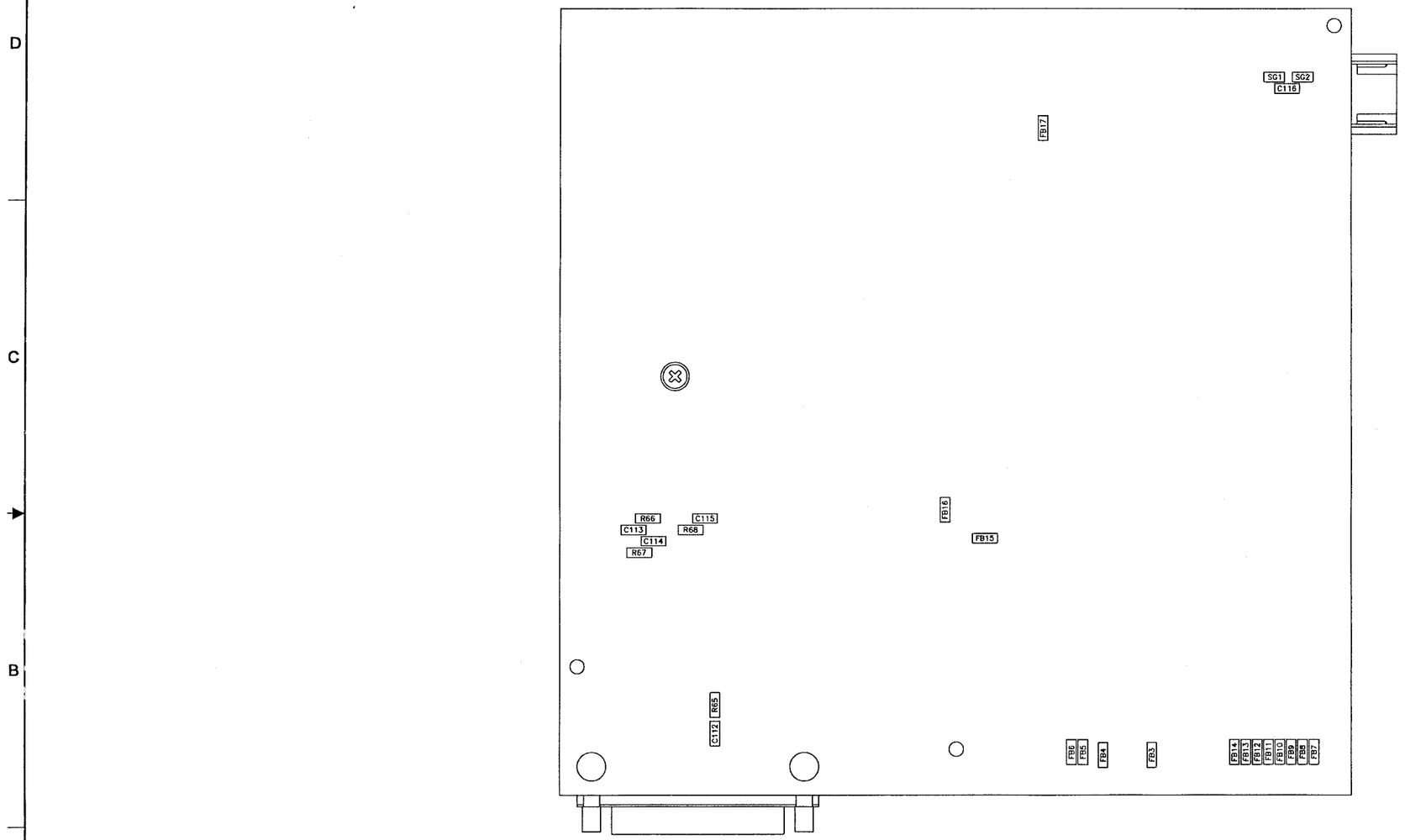
NEXT ASSY: SEE TAB

NOVAMETRIX MEDICAL SYSTEMS INC.

TITLE: MAIN BOARD ASSY

SIZE	DRAWING NO.	CODE	REV
D	2775	01	SEE TAB

SCALE: 2/1 SHEET 1 OF 2



DRAWING TABULATION			
DWG NO.	REV	TITLE	NEXT ASSY
D2775-01	04 N820	MAIN BOARD ASSEMBLY, 520A	D5693-01
D2775A-01	04 N820	MAIN BOARD ASSEMBLY, 2001	D9400-01

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REV	R NO.	DATE
04	N820	17Nov00
03	N804	11Oct00
02	N745	5Apr00
01	N727	17Jan00

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [mm]
TOLERANCES
.XX ±.01 [.254]
.XXX ±.005 [.127]
.XXXX ±.0025 [.064]
FRAC ±1/64
ANG ±1/4°

DRAWN B. Lancaster	DATE 29Jul99
CHECK MRL	DATE 80ct99
MFG ENGR T. Carroll	DATE 80ct99
ENGR ~	DATE
PROJ ENGR AJE	DATE 80ct99
NEXT ASSY: SEE TAB	

NOVAMETRIX MEDICAL SYSTEMS INC.

TITLE: MAIN BOARD ASSY

SIZE	DRAWING NO.	CODE	REV
D	2775	01	SEE TAB

SCALE: 2/1 SHEET 2 OF 2

ADDRESS BUS

DATA BUS

CONTROL BUS

TO SHEETS 2 , 3 AND 4

VCC

RP1 10k

FB1 Ferrite Bead

C33 .1u

IC16 HD64180

VDD, NMI*, BUSREQ*, LIR*, HALT*, ST, RXA0, TXA1, RXA1, RESET*, TOUT, REF, TEND1*, TXS, DREQ1*, CKA1, CKA0, CKS, RTS0*, TXA0, BUSACK*, XTAL, EXTAL, RXS, CTS0*, DCD0*, VSS, CLK/2, WAIT*, INT2*, INT1*, INT0, E, IOE*, ME*, A17–A0, D7–D0, RD*, WR*

FB2–FB16 BLM31A601S

C35 22p, C34 22p, Y1 12.288Mhz

C37 .1u

IC19A 74HC14, IC19B 74HC14, R26 1k, RP5 100k, Y2 3.2768Mhz, C38 22p, C39 22p

CLKSEQ

RP3 100, RP11 100, RP6 100k, RP11 100

SPARES

IC19E 74HC14, IC19F 74HC14, IC19D 74HC14, IC19C 74HC14

IC46B 74HC32, IC46C 74HC32, IC46D 74HC32

IC17 AT29C010A

C40 .1u

IC20 HM6225BLP-12

C41 .1u

VBACK

IC21A 74HC14, IC21F 74HC14, IC21B 74HC14, IC21C 74HC14, IC21E 74HC14

IC22 74HC138

C44 .1u

IC23D 74HC32, IC23A 74HC32, IC23B 74HC32

C47 .1u

IC46A 74HC32, IC23C 74HC32

RDKEY2, RDKEY*

C49 .1u

IC18 18CV8

C111 220p

DACCS*, AUD*, 0PORT, WR*, LPORT, WRDISP*, DISPCS*, RD*

RESET*, CPUINT*, CSADC1*, CSADC2*, CSADC3*, CLKS, MR, WDCLR, WDTO*

RP2 10k CSADC1*, CSADC2*, CSADC3*

IC25A 74HC32, IC25B 74HC32, IC25C 74HC32, IC25D 74HC32

FB15 BLM31A501S ROMCS*, FB16 BLM31A601S RAMCS*

PWRON*

C43 .1u, C58 .1u

IC28 74HC573

J107

C105 .1u

D11 1N4148, C45 10u 50v, C46 100u 6.3v, C48 .1u

R18 10k

J103

C32 .1u

See Note 5.

Rev.	"R" No.	By Date
04	N820	17Nov00
03	N804	5Oct00
02	N745	5Apr00
01	N727	17Jan00

SCHEMATIC, MAIN BOARD, 520A & 2001

Drawn: EJM 12Aug99 | Checked: MRL

Mfg Eng: TC 07oct99 | Approved: AJE 7Oct99

File: 27750304 | Date: Friday, November 17, 2000

Novametrix

Medical Systems, Inc.
1 Barnes Industrial Park Road
Wallingford, CT USA 06492

Size	Document Number	Code	Rev
B	2775 & 2775A	03	04

Sheet 1 of 4

CONTROL BUS

To Sheet

Note:
JP2 Out - Vref = 2.5V
JP2 In - Vref = 3.0V

Note:
R32 = 162k for Vref = 2.5V
R32 = 287k for Vref = 3.0V

Rev.	"R" No.	By Date
04	N820	17Nov00
03	N804	5Oct00
02	N745	5Apr00
01	N727	17Jan00

SCHEMATIC, MAIN BOARD, 520A & 2001

Drawn: EJM 12Aug99 | Checked: MRL
Mfg Eng: TC 07oct99 | Approved: AJE 7Oct99
File: 27750304
Date: Friday, November 17, 2000

Novametrix
Medical Systems, Inc.
1 Barnes Industrial Park Road
Wallingford, CT USA 06492

Size	Document Number	Code	Rev
B	2775 & 2775A	03	04

Sheet 2 of 4

ADDRESS BUS

DATA BUS

CONTROL BUS

TO SHEETS 1, 2 AND 4

IC24 MSM6242BRS — VBACK, VCC, C42 2.2u 35v, RP2 10K, RP2 10K, Y3 32.768KHz, C57 22p, C59 22p

IC27 — AUD CLK, WAIT*, WR*, AUD*, SEE NOTE 2, C56 .1u, C61 .1u, C62 .01u, R30 10K, RP11 100, C52 .1u, RP11 100, RP11 100, IC26 TBA820M, C55 100u 6.3v, C54 .022u, R28 1, C53 .22u, C63 100u 6.3v, C60 47u 10v

This supply connects back to switcher +5v

R51 10 1/2w, Q16 IRF9523, C110 1000u 16v, R64 1, DSPBR

IC45 E1166 — CCD+, CCD-, J106 CON4

This point connects back to switcher gnd

IC29 AD7528 — C108 .1u, RP12 41.0K, IC30D TL074, RP12 41.0K, 4VREF, SNDOUT, J109, VLED, IC30C TL074, C84 .1u, C83 .1u, IC30B TL074, R36 23.7K, RP12 41.0K, RP12 41.0K, IC30A TL074, R60 10K, Q10 2N3906, CNTRST, KJL*, J105, Q17 VN0610L, -V12, +V12

IC13 74HC573 — C29 .1u, CAL, TML, AOL, ARL, KJL*, BTL, DSPBR, OFFDIS, LPORT

IC14 74HC573 — RDKEY*, C30 .1u, RP7 100K

IC15 74HC573 — RDKEY_2*, RP13 100K

D9 1N4148

J104 — SWGND, RGND, LGND, LINEST ON/OFF, TML, AOL, ARL, KJL*, BTL, DSPBR, OFFDIS, S2, S3, S4, S5, S6, S7, LINEST S9, S9, S8, S10, S11 (SPARE), N/C

MARS*

NOTES:
1. UNLESS OTHERWISE SPECIFIED :
   RESISTANCE VALUES ARE IN OHMS, 1/4 W, 1%
   CAPACITANCE ARE IN FARADS
2. TONE GENERATOR BOARD 2755-01 FITTED IN PLACE OF IC27
3. LAST REFERENCE DESIGNATOR USED: C116, D18, F2, FB18, IC46, J109, JP2, L2, Q17, R68, RP13, SG2, T1, TP2, VR1, W1, Y3
4. REFERENCE DESIGNATORS NOT USED: C31, C36, D10, R23, R27
5. 2776-01 ASSY IS PART OF 2775A-01 ASSY.

Rev.	"R" No.	By Date
04	N820	17Nov00
03	N804	5Oct00
02	N745	5Apr00
01	N727	17Jan00

SCHEMATIC, MAIN BOARD, 520A & 2001

Drawn: EJM 12Aug99 | Checked: MRL | Mfg Eng: TC 07oct99 | Approved: AJE 7Oct99

Novametrix
Medical Systems, Inc.
1 Barnes Industrial Park Road
Wallingford, CT USA 06492

Size B | Document Number 2775 & 2775A | Code 03 | Rev 04

File: 27750304 | Date: Friday, November 17, 2000 | Sheet 3 of 4

ISOLATION BARRIER

VBACK
RP4 100k
D6 1N4148
IC11B 4093
C23 .1u
IC10A
Q1 VDD D1 CLK1 S1 R1 Q1 4013
C26 .1u
IC10B
CLK2 Q2 D2 S2 R2 VSS Q2 4013
RP4 100k
J102
LINEST DGND VIN VBAT
SYNC
VBAT

+V12
IC7 78L12 VOUT VIN GND
C18 10u 16vtant
+VA
C113 100p
R66 100
D2 UF4002
C13 .1u
C11 470u 25v
T1
C12 .1u
C10 470u 25v
R68 100
C115 100p
D4 UF4002
D3 UF4002
-V12
IC8 79L12 VOUT VIN GND
C17 10u 16vtant
TP1
L1
C9 1500u 16v
C114 100p UF5400
R67 100
C20 1000u 16v 18 uH
VCC
F1 1A Slo-Blo
C7 .22u 63v
R8 1K
R7 475
D5 UF4002
C8 .022u
R16 4.75k
VR1 2k
R17 3.74k

R65 100
C112 100p
D1 UF4002
C1 1500u 16v
IC2 78M05 VIN VOUT GND
C2 .1u
J101
VRAWI GNDI VCCI TX1TTL 5 DTR CTSI RXOI TX1I TXOI
C3 10u 16vtant
C4 10u 16vtant
IC1 V- GND VCC V+ TR1IN TR2IN R1OUT R2OUT LT1081 R2IN R1IN TR2OUT TR1OUT C1+ C1- C2+ C2-
C5 10u 16vtant
C6 10u 16v tant
JP1
Comm. Config.
E1
GL302

NOTE: JUMPER W1 CONNECTS 2-3 FOR MODEL 520A, AND 1-2 FOR MODEL 2001

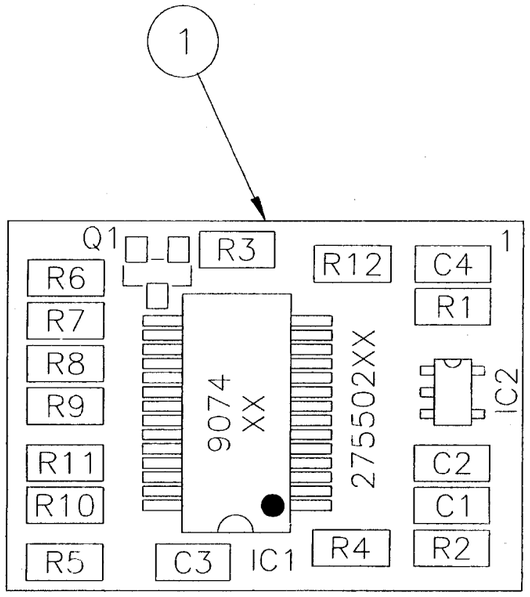
R63 100
R19 12.1k
Q8 BS250
R12 100k
C51 33p
Q7 VN0610L
C16 .47u
IC9 UC3843 VCC VFB VREF COMP OUT RT/CT GND ISEN
FB18 Ferrite Bead Thru_Hole
Q5 IRF540
R11 22
R10 22.1k
R25 475
C14 .1u
R13 8.66k
Q9 ZTX109C
C15 .01u
TP2
C19 .01U
R15 1k
R14 47
C50 470p
R9 1k
R4 0.33 1/2w 10%
R5 0.33 1/2w 10%
R6 0.33 1/2w 10%
TX0
R62 10K
Q3 BC214C
TX1
R61 10K
Q4 BC214C
R24 475

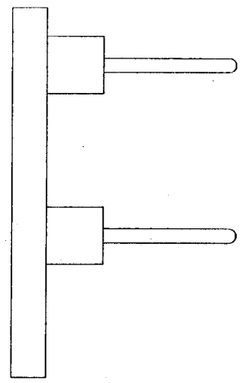
IC3 CNY17
IC4 CNY17
IC5 CNY17
IC6 CNY17
RP6 100K
RP5 100K
RP6 100K
RP6 100K
RP5 100K
RP5 100K
RP5 100K
RX0
CTS*
R1 475
Q1 BC214C
R2 475
Q2 BC214C

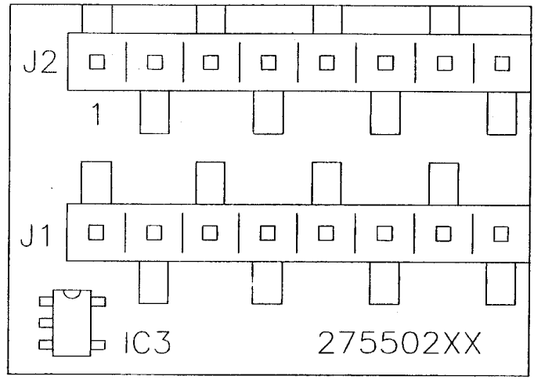
R21 47.5k
IC11C 4093
C28 2.2u 35v
R22 10k
ONOFF
PWRON*
IC11D 4093
C24 .1u
C25 .1u
IC11A 4093
OFFDIS
C21 .1u
RP4 100k
D7 1N4148
RP4 100k
D8 1N4148
Q6 BS250
RP4 100k
C109 220u 63v
R20 475
C22 2.2u 35v
IC12 LP2950AC VIN VOUT GND
VBACK
VCC
D47 BAT82
D18 1N4148
C27 47u 10v

R3 100M 1W 5%
R69 470k 1/2W 5%
C117 220pf 3kV
C118 220pf 3kV

			SCHEMATIC, MAIN BOARD, 520A & 2001		Novametrix Medical Systems, Inc. 1 Barnes Industrial Park Road Wallingford, CT USA 06492	
			Drawn: EJM 12Aug99	Checked: MRL		
04	N820	17Nov00	Mfg Eng: TC 07oct99	Approved: AJE 7Oct99	Size: B	Document Number: 2775 & 2775A
03	N804	5Oct00			Code: 03	Rev: 04
02	N745	5Apr00	File: 27750304		Sheet 4 of 4	
01	N727	17Jan00	Date: Friday, November 17, 2000			
Rev.	"R" No.	By Date				







NOTES:

1. COMPONENTS NOT FITTED: Q1, R11

REV	R NO.	DATE
02	N699	4Oct99
01	Prod	Release

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES

TOLERANCES
.X ±.02
.XX ±.01
.XXX ±.005
.XXXX ±.0010
FRAC ±1/64
ANG ±1/4°

MATERIAL ~

FINISH ~

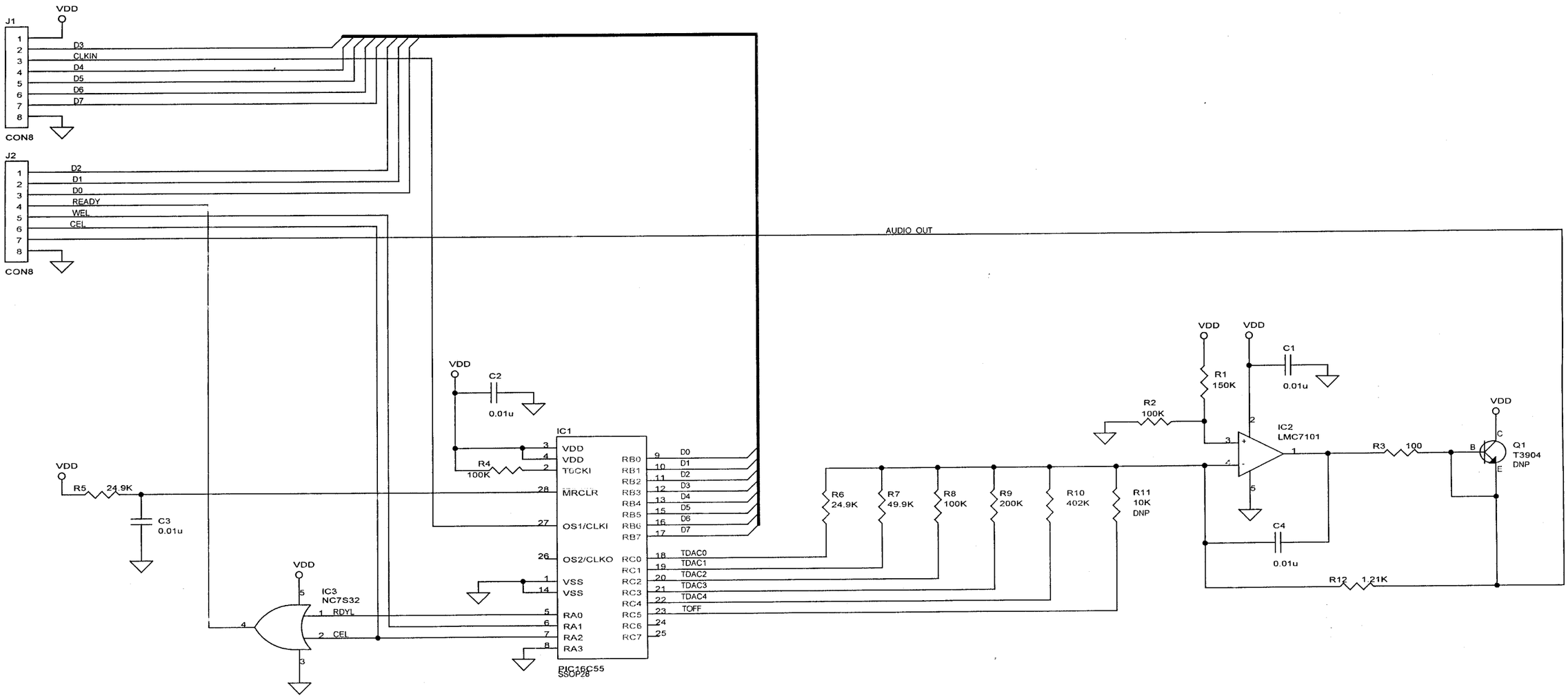
TITLE
TONE GENERATOR
REPLACEMENT BOARD
ASSY

DRAWN BL 5Jan98 | CHECKED MRL 26Feb98
MFG ENGR TJC 26Feb98 | APPROVED RHD 26Feb98
USED ON: ~

NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
B	2755	01	02

SCALE: 4/1 | SHEET 1 OF 1



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE VALUES ARE IN OHMS, 1/16W 1%
   CAPACITANCE VALUES ARE IN FARADS
2. LAST REF DES USED: C4, IC3, J2, Q1, R12
3. COMPONENTS NOT FITTED IN THIS ASSEMBLY: Q1, R11

Rev.	"R" No.	By Date
02	N699	5Oct99
01	Prod	Release

Schematic, Tone Generator Replacement Board

Drawn: RDaniels 23Dec97 | Checked: MRL 25FEB98 | Approved: RHD 5FEB98 | Mfg Eng: TC 17FEB98

File: SCHEMATIC1

Date: Tuesday, October 05, 1999

Novametrix
Medical Systems, Inc.
5 Technology Drive
Wallingford, CT USA 06492

Size	Document Number	Code	Rev
B	2755	03	02

Sheet 1 of 1

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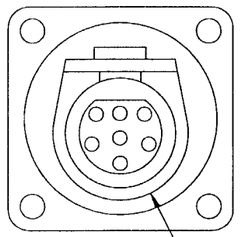
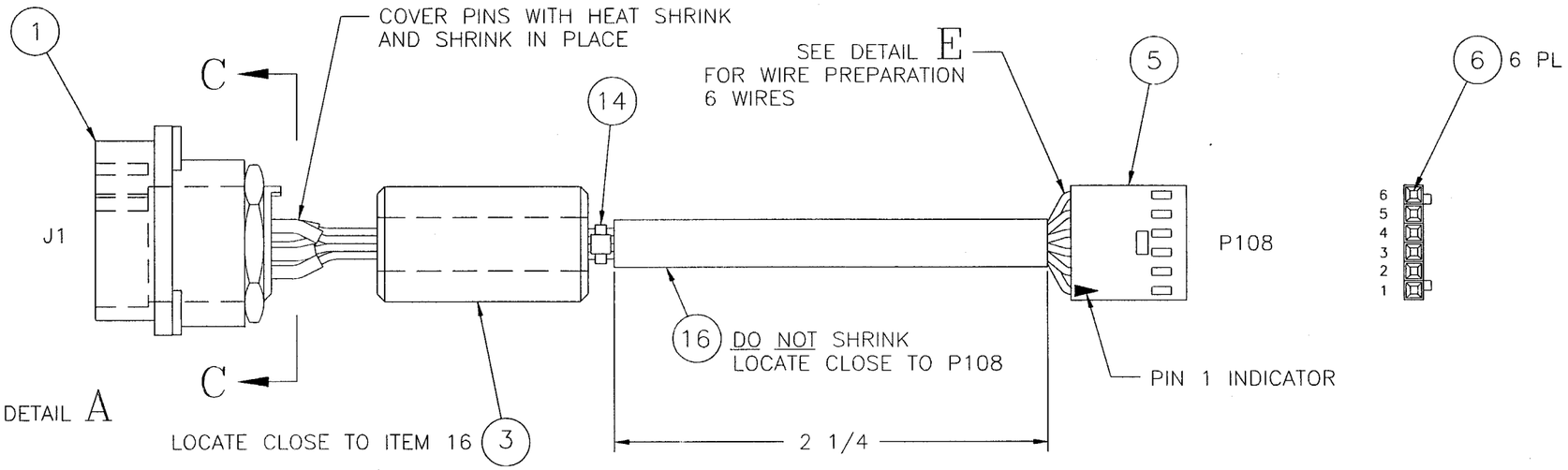
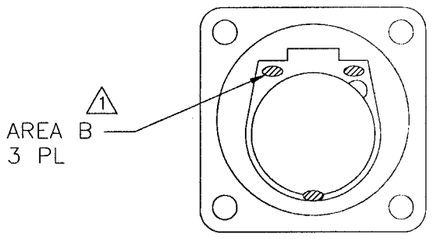
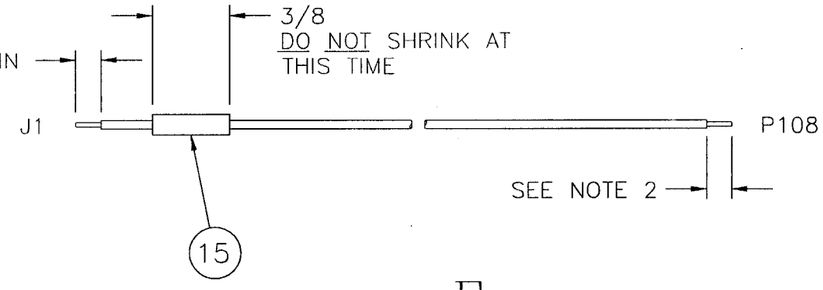


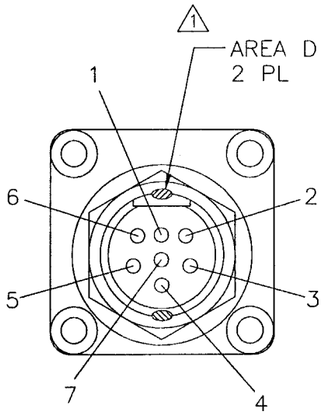




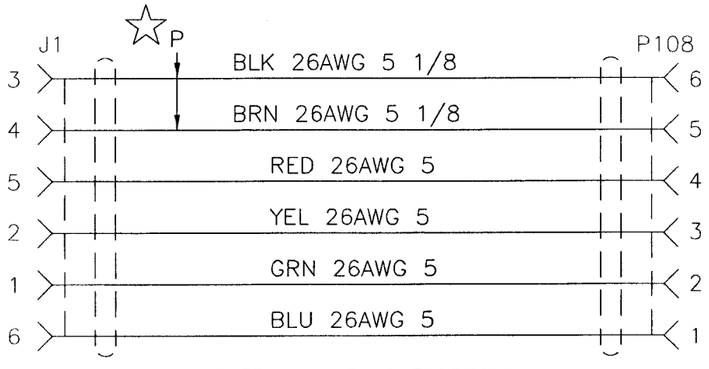
DETAIL A



DETAIL E



REAR VIEW C—C



OVERALL WIRING DIAGRAM

☆ TWIST BLACK & BROWN WIRES 6 TURNS CLOCKWISE.

NOTES:

1. BEFORE ASSEMBLING ITEMS 1 & 4, APPLY 1 DROP OF ITEM 2 TO DRESS BEZEL IN AREA B AS SHOWN IN DETAIL A AND TO AREA D IN REAR VIEW C–C. FINGER TIGHTEN NUT ONTO CONNECTOR UNTIL IT BOTTOMS OUT AGAINST ITEM 1. ALLOW ASSY TO CURE FOR 24 HOURS.
2. WIRE WILL BE PREPPED WHEN CONTACT (ITEM 6) IS INSTALLED. FOR REFERENCE ONLY: 1/8 STRIP DO NOT TIN.
3. FOR EPOXY MIXING ASSY PROCEDURE SEE A9779–33.

REV	R NO.	DATE
05	N718	25Jan00
04	N681	16Jul99
03	N366	17May95
02	N302	26MAY92
01	N299	26MAR92

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ——— (mm) ———
FRAC ± 1/16 (mm)
HOLES +.007 −.003 (mm) (+.18 −.08)
ANG ± ———
MATERIAL ———
FINISH ———

TITLE
CABLE ASSY, SaO2 INPUT, MODEL 520A

DRAWN	CHECKED
MRL 23.OCT.91	A.J.E.
MFG ENGR B.N. 12FEB92	APPROVED A.P. 2FEB92

USED ON: D5693–01

NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
C	5728	01	05

SCALE: 2/1 SHEET 1 OF 1

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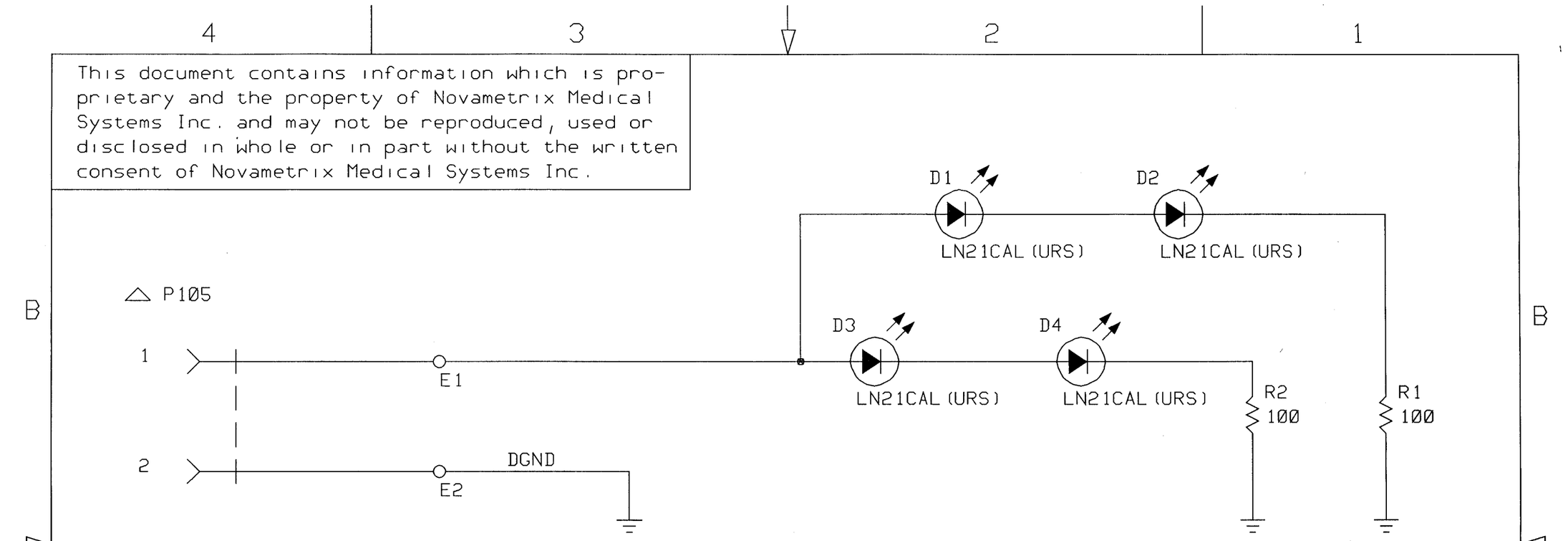

△ NOTES:
1. UNLESS OTHERWISE SPECIFIED:RESISTANCE VALUES ARE IN OHMS, 1/4W, 1%.
2. LAST REFERENCE DESIGNATOR USED: D4, E2, P105, R2.

			DO NOT SCALE UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm) BREAK ALL SHARP EDGES	SCHEMATIC, ALERT BOARD, MODEL 520A	NOVAMETRIX Medical Systems, Inc. Wallingford, CT USA 06492
			MATERIAL: ———	DRAWN Tony Esposito 1-May-92	CHECKED M.R. Lineback 15May92
			FINISH: ———	MFG. ENGR Ed Harvie 5-15-92	APPROVED A.E. Kersey 15-May-92
01	N304	9Nov92	FILE: 24730301 DATE: 18-Apr-96 TIME: 16:30:05	USED ON D2473-01	SIZE B · DWG NO. 2473 · CODE 03 · REV. 01 SCALE: NONE · SHEET 1 OF 1
REV.	"R" NO.	BY DATE			

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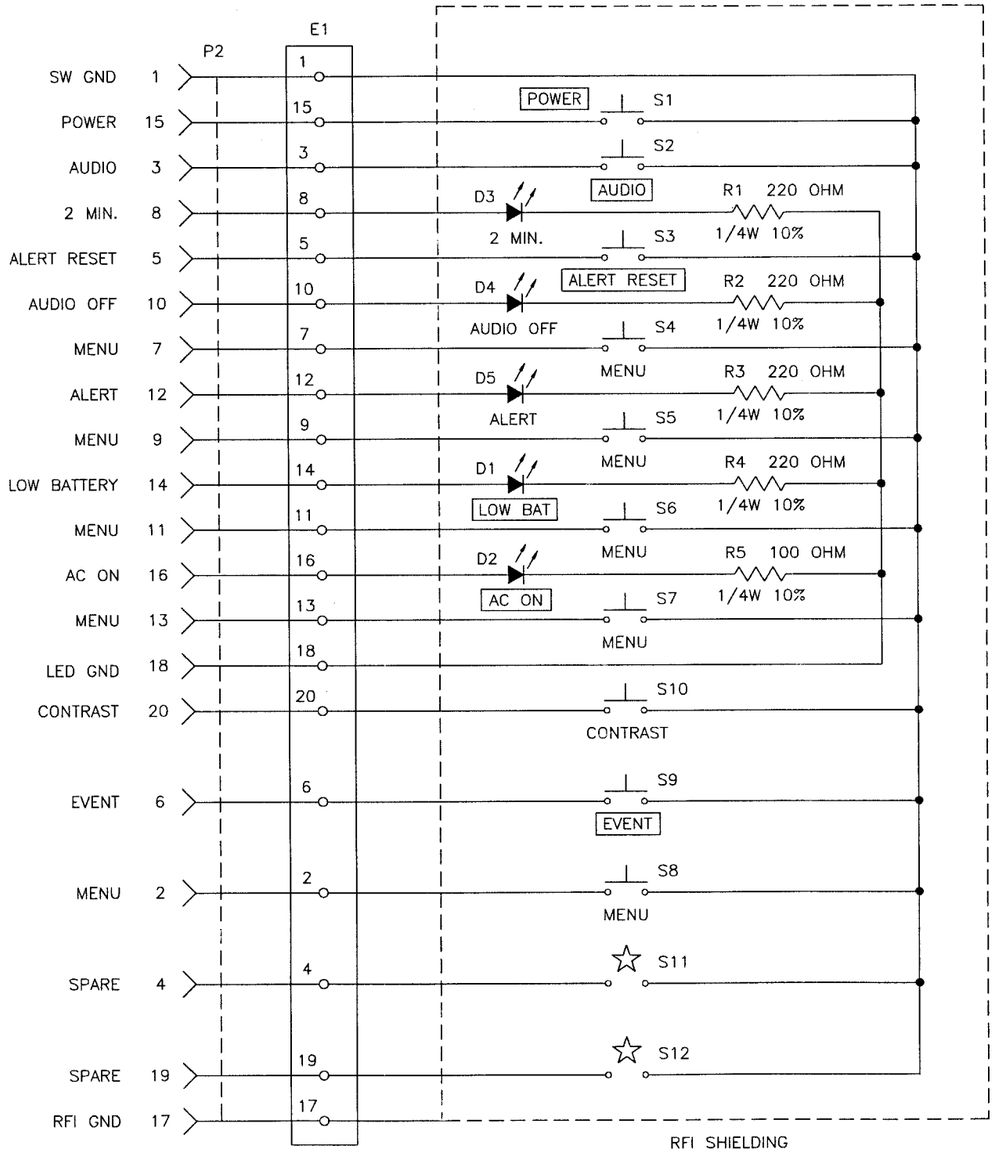

SCHEMATIC DIAGRAM

☆ S11 & S12 ARE ALLOWED FOR IN THE CIRCUITRY BUT ARE NOT USED FOR THIS KEYPANEL.

REV	R NO.	DATE
05	N388	2Apr96
04	N316	25MAR93
03	N296	3/31/92
02	N296	3/11/92
01	N292	2/19/92

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± — (mm) —
FRAC ± — (mm) —
HOLES ±.007 -.003 (mm) (+.18 -.08)
ANG ±
MATERIAL —
FINISH —

TITLE: MEMBRANE KEYPANEL, OXYPLETH – 520A

DRAWN MRL 30MAY91 | CHECKED A.P.
MFG ENGR | APPROVED A.P.
USED ON: D5719-01

NOVAMETRIX MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A 06492

SIZE	DRAWING NO.	CODE	REV
D	5676	27	05

SCALE: NONE | SHEET 2 OF 2

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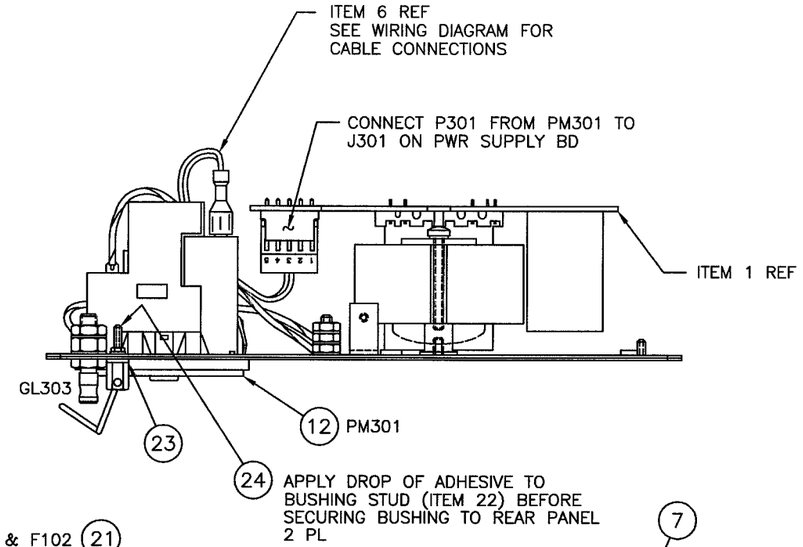
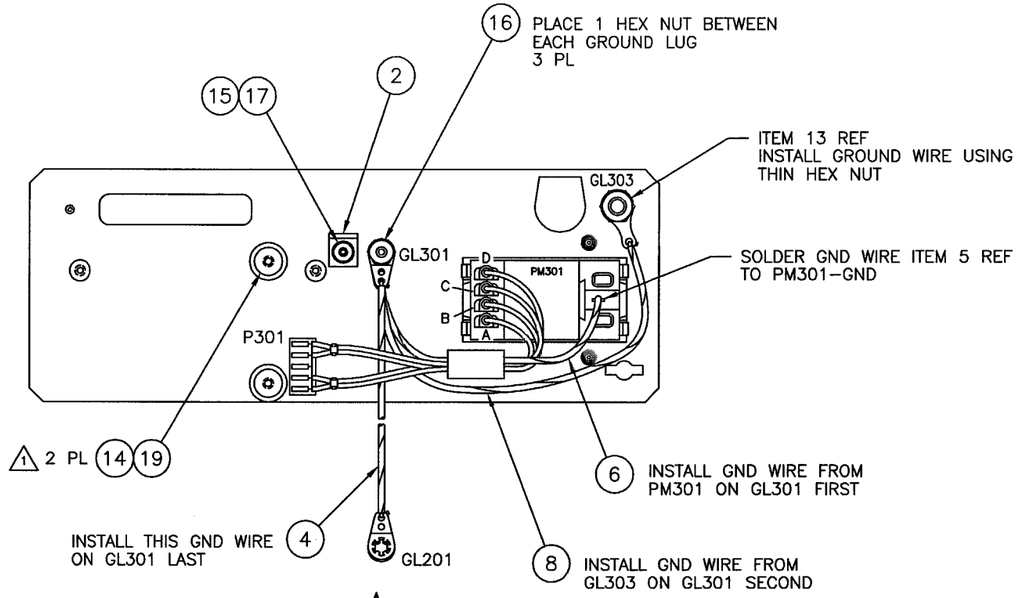
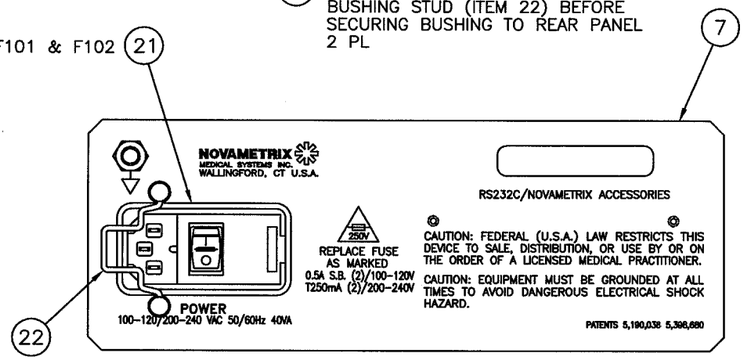
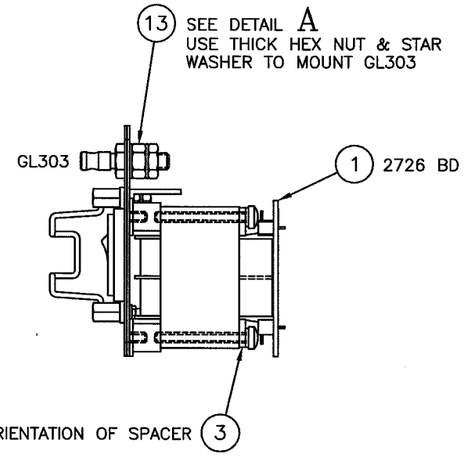
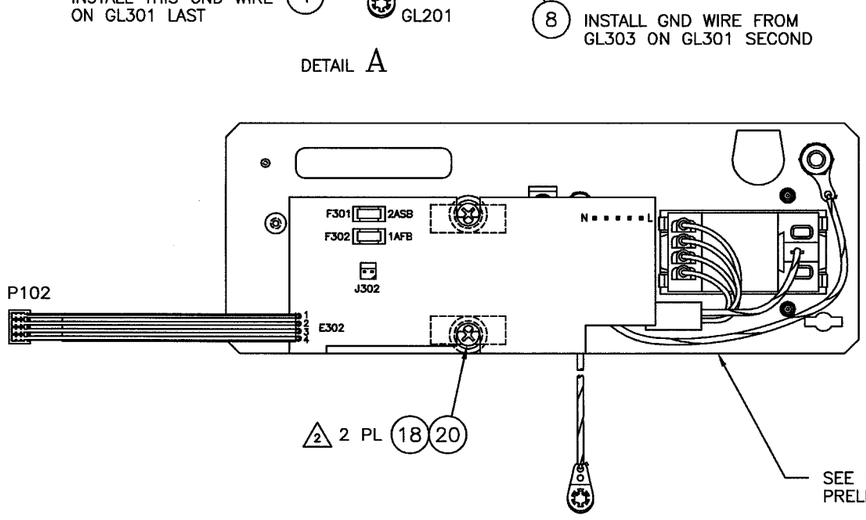
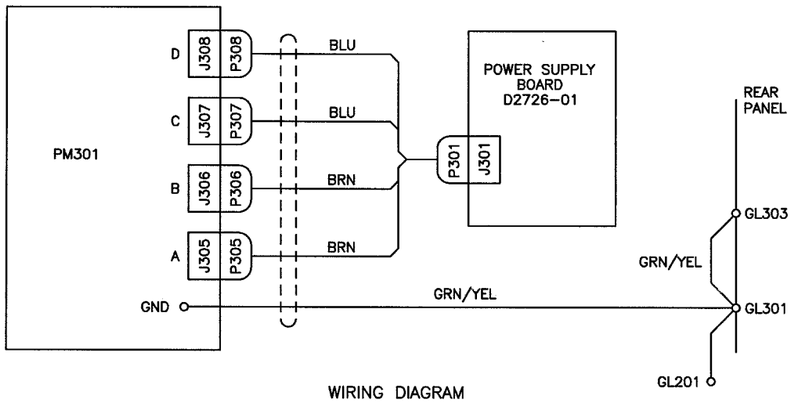

ITEM 6 REF
SEE WIRING DIAGRAM FOR CABLE CONNECTIONS
CONNECT P301 FROM PM301 TO J301 ON PWR SUPPLY BD
ITEM 1 REF
GL303
23
12 PM301
24 APPLY DROP OF ADHESIVE TO BUSHING STUD (ITEM 22) BEFORE SECURING BUSHING TO REAR PANEL 2 PL




F101 & F102
21
7
NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A.
RS232C/NOVAMETRIX ACCESSORIES
250V
REPLACE FUSE AS MARKED
0.5A S.B. (2)/100-120V
T250mA (2)/200-240V
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK HAZARD.
POWER
100-120/200-240 VAC 50/60Hz 40VA
PATENTS 5,190,038 5,306,680
22







WIRING DIAGRAM

NOTES:

1. APPLY A SMALL DROP OF ADHESIVE, ITEM 11 TO STUDS, ITEM 7 BEFORE ASSEMBLY.
2. APPLY A SMALL DROP OF ADHESIVE, ITEM 11 TO SCREWS, ITEM 20 BEFORE ASSEMBLY.

REV	R NO.	DATE
03	N547	6Feb98
02	N418	2Dec96
01	N377	10Jan96
00	N375	13Nov95

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± ~ (mm) (± ~)
FRAC ± ~ (mm) (± ~)
HOLES +.007 -.003 (mm) (± ~)
ANG ± ~
MATERIAL ~
FINISH ~

TITLE: REAR PANEL ASSY, MODEL 515A SB & 520A

DRAWN BGG 15Aug95 | CHECKED MRL 1Mar96
MFG ENGR EH 3-1-96 | APPROVED AJE 2-1-96
USE ON: 5693-01 & 5750-01

NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A. 06492

SIZE	DRAWING NO.	CODE	REV
D	6538	01	03

SCALE: 1/1 | SHEET 1 OF 1

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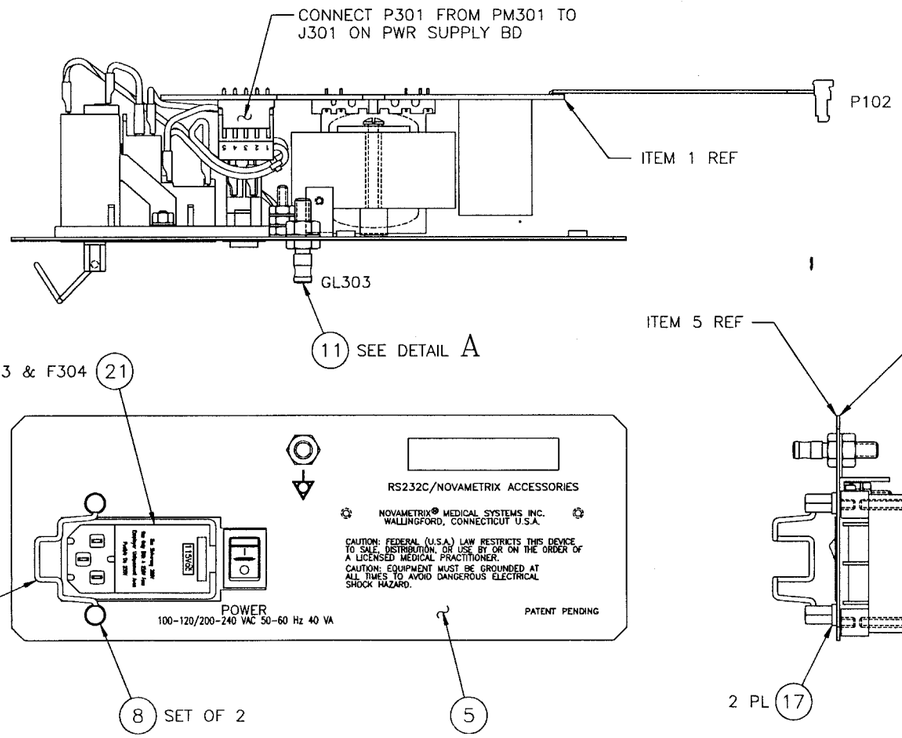
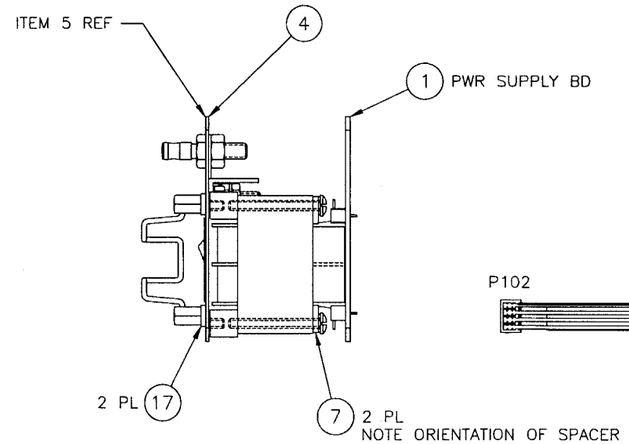
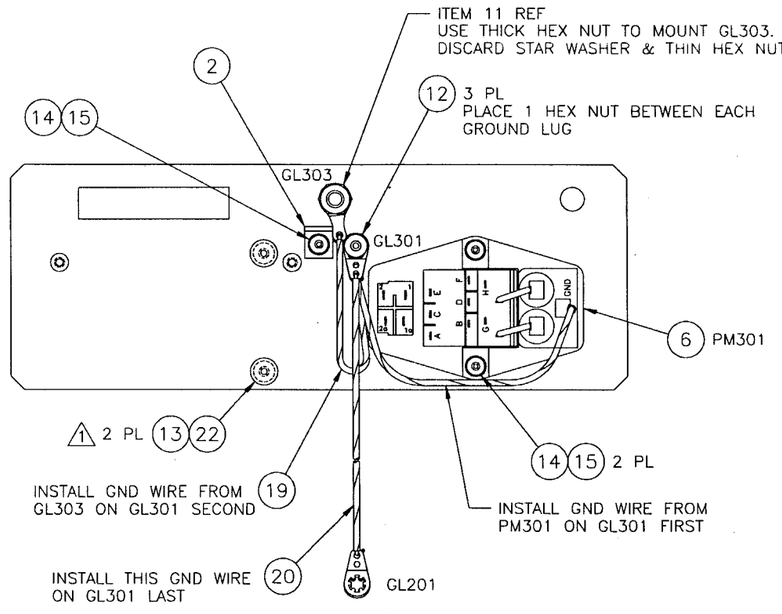
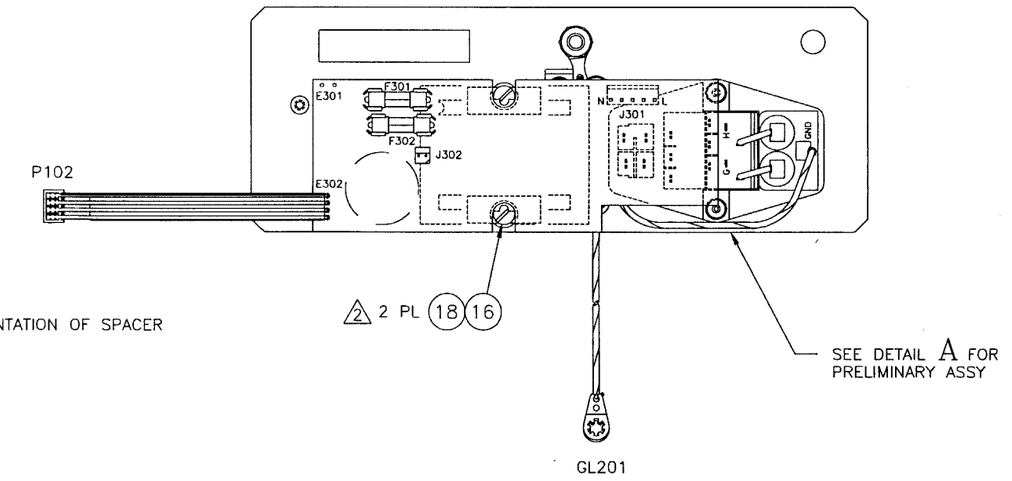

CONNECT P301 FROM PM301 TO J301 ON PWR SUPPLY BD
P102
ITEM 1 REF
GL303
11 SEE DETAIL A
F303 & F304 21
RS232C/NOVAMETRIX ACCESSORIES
NOVAMETRIX® MEDICAL SYSTEMS INC. WALLINGFORD, CONNECTICUT U.S.A.
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK HAZARD.
POWER
100-120/200-240 VAC 50-60 Hz 40 VA
PATENT PENDING
3
8 SET OF 2
5







NOTES:

1. APPLY A SMALL DROP OF ADHESIVE, ITEM 23, TO STUDS, ITEM 13, BEFORE ASSEMBLY.
2. APPLY A SMALL DROP OF ADHESIVE, ITEM 23, TO SCREWS, ITEM 18, BEFORE ASSEMBLY.

REV	R NO.	DATE
03	N325	8Jul93
02	N316	24MAR93
01	N304	14OCT92

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm)
BREAK ALL SHARP EDGES
TOLERANCES
DEC ± —— (mm) ——
FRAC ± —— (mm) ——
HOLES +.007 −.003 (mm) (+.18 −.08)
ANG ± ——
MATERIAL ——
FINISH ——

TITLE: REAR PANEL ASSY, MODEL 520A AND 515A SB

NOVAMETRIX MEDICAL SYSTEMS INC.
WALLINGFORD, CT U.S.A 06492

DRAWN	CHECKED
MRL 20FEB92	AE 29APR92
MFG ENGR EH 29APR92	APPROVED AK 29APR92

USE ON: 5693-01/5750-01

SIZE	DRAWING NO.	CODE	REV
D	5673	01	03

SCALE: 1/1 SHEET 1 OF 1

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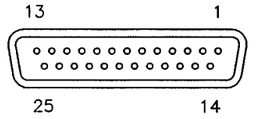
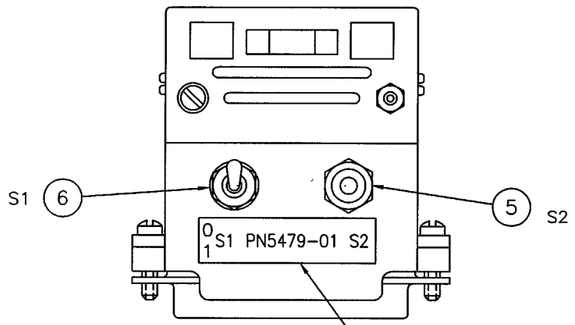
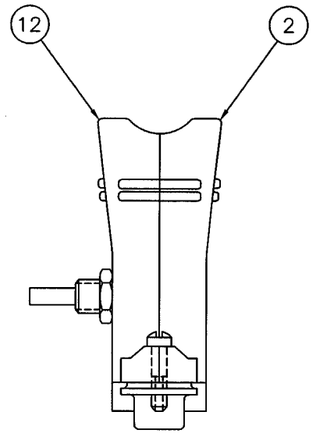
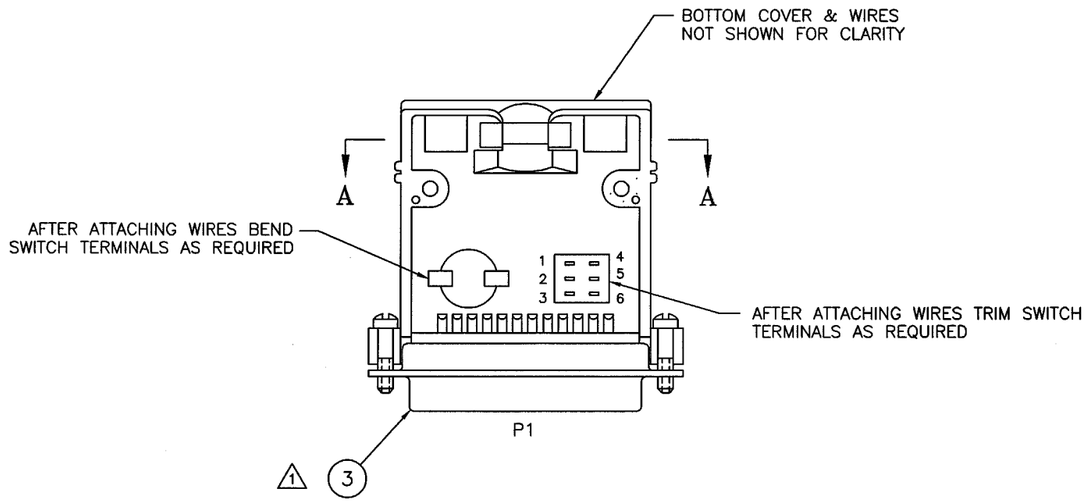
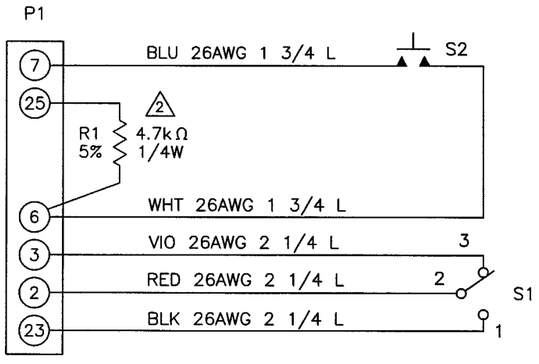


REAR VIEW A–A







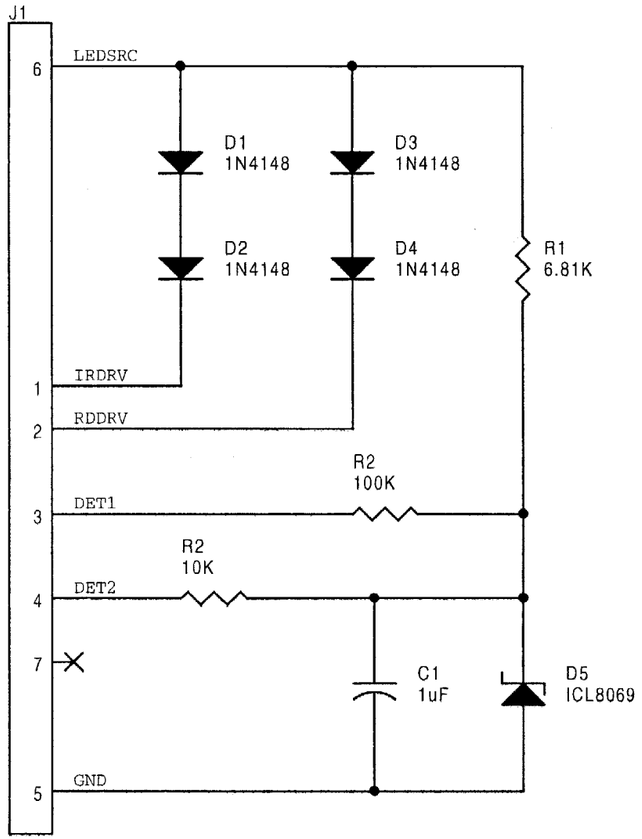


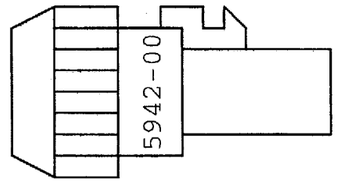
WIRING DIAGRAM
NOTE: 1/8 STRIP & TIN ON EACH END FOR ALL WIRES.

NOTES:

1. COVER WIRE CONNECTIONS WITH HEAT SHRINK, ITEM 13, 5 PL @ 3/8 L.
2. COVER LEAD OF RESISTOR, ITEM 4 FROM P1–25 WITH 3/8 L TUBING, ITEM 11.

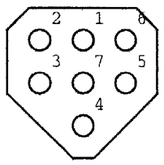
			DO NOT SCALE UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (mm) BREAK ALL SHARP EDGES TOLERANCES DEC ± ~ (mm) (± ~) FRAC ± 1/32 (mm) (± ~) HOLES +.007 −.003 (mm) (+.18 −.08) ANG ± ~	TITLE: RS–232–C TEST FIXTURE ASSY, MODEL 515 & 515A	NOVAMETRIX MEDICAL SYSTEMS INC. WALLINGFORD, CT U.S.A. 06492
			MATERIAL ~	DRAWN RGG 4Dec95 / CHECKED MRL 29Feb96	SIZE D / DRAWING NO. 5479 / CODE 01 / REV 01
01	N338	4Dec95	FINISH ~	MFG ENGR RH 3–20–96 / APPROVED AEK 18–Mar–96	
REV	R NO.	DATE		USED ON: ~	SCALE: 2/1 / SHEET 1 OF 1





Mark the test jack part number, as shown, on the completed assembly

Connector Pin Out
Rear View



Parts List

Qty	Part#	Description
1	152014	Capacitor, 1uF
1	211705	Connector, 7 Pin, Hypertronics
1	472026	Resistor, 6.81K
1	472030	Resistor, 10K
1	472058	Resistor, 100K
1	481000	Diode, Zener, ICL8069
4	481501	Diode, 1N4148

Novametrix Medical Systems

Title: Front End Saturation Test Jack

Size	Document Number	Rev
A	5942-00	00

Date: Wednesday, June 28, 2000 Sheet 1 of 1